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JACZEWSKI (A. A.) & JACZEWSKI (P. A.). Определитель грибов. Совершенные грибы (диплоидные стадии.) Том I. Фикомицеты. [A key to fungi. Perfect fungi (Diploid stages). Vol. I. Phycomycetes.]—3rd, revised and augmented ed., 293 pp., 329 figs., Гос. Издат. С.-хоз. и Колхозно-Кооп. Литературы. [State Publishing Office of Agric. and Collective Farming Co-operative Literature], Leningrad, 1931.

In this, the first of a series of seven volumes covering the whole range of fungi so far known to science, the authors give diagnoses in Russian of species belonging to about 170 genera of the Phycomycetes, together with an exhaustive list of their substrata and hosts and, in regard to those that occur on the territory of the Union of Soviet Republics, notes of local interest. The Phycomycetes are divided into four main groups, namely, Uniciliatae, Biciliatae, Polyciliatae, and Aciliatae. The book is richly illustrated with figures, most of which are original, and is supplied with Latin indexes of the generic and specific names of the fungi, and of their hosts and substrata.

TUNSTALL (A. C.). **Heavy pruning and stem disease.**—*Quart. Journ. Indian Tea Assoc., 1931*, 3, pp. 145–158, 3 pl., 1931.

Some general observations are made on the connexion between excessive pruning and the progressive deterioration of tea plantations which occurs in areas in every tea district in Assam, associated with severe stem disease. Affected plants show the roots in good condition, but the stems are full of rotting holes. In early stages new growth arises from the collar, but eventually this becomes involved and a rotting stump is left with a few weak shoots. The disease in question is not due to any specific organism and is thought to arise from the physiological condition of the plants, though soil deficiency is evidently not involved as bushes newly planted in the affected areas grow normally. The problem is discussed in the light of recent information concerning the metabolism of the tea plant (pruned and unpruned) and the climatic conditions influencing the success of heavy pruning. Notes are also given on the method of ascertaining the amount of starch reserves in tea roots, the healing of wounds, wound paints, fungous infection of dead branches, preparation of bushes for heavy pruning, and other items of interest.

Dry rot in buildings: recognition, prevention, and cure.—*Dept. Sci. & Indus. Res., Forest Products Res. Leaflet* 6, 5 pp., 2 figs., 1931.

This is a condensed version of *Forest Products Res. Bull.* 1, entitled 'Dry-rot in wood', a notice of which has already appeared [*R.A.M.*, viii, p. 79]. In addition to *Merulius lacrymans*, the true dry rot fungus, *Coniophora cerebella*, *Poria vaporaria*, and *Paxillus panuoides* are mentioned as contributory causes of decay in timber in buildings.

MAGERSTEIN [V.]. **Rakovina Vrby.** [Crown gall of the Willow.] —*Ochrana Rostlin*, xi, 3–4, pp. 135–137, 2 figs., 1931.

Plantations of the American basket willow (*Salix americana*) over practically the whole of Czecho-Slovakia, but more particularly on heavy, acid, waterlogged soils, are stated to be heavily attacked by crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, viii, p. 347] which, besides stunting the twigs, renders them brittle and thus impairs their industrial utility. For the control of the disease the author recommends painting the willow stocks, while still in the dormant stage, with phenol preparations, e.g., a 5 to 7·5 per cent. solution of plantasan, arborol, or the like. It was noted that outbreaks of the crown gall are almost everywhere coincident with heavy infestation of the willow plantations by the weevil *Cryptorrhyncus lapathi*, the larvae of which feed on the galls and are an important pest of the trees.

WEISS (A.). **Ist der Pilz Graphium die Ursache des Ulmensterbens?** [Is the fungus *Graphium* the cause of the die-back of Elms?]—*Gartenwelt*, xxxv, 48, pp. 657–658, 1931.

The writer is inclined, as a result of extensive observations in Berlin, to attribute the widespread die-back of elms primarily to the sinking of the ground water level, e.g., near underground railways and canals, rather than to infection by *Graphium ulmi* [*R.A.M.*, xi, p. 14]. A contributory cause of the disease was the abnormally cold winter of 1928–9, while the activities of the sap beetle [*Scolytus scolytus*] must also be taken into consideration [see next page].

WOLLENWEBER (H. W.) & RICHTER (H.). **Infektionsversuche mit Graphium ulmi an Ulmen und anderen Laubbäumen.** [Inoculation experiments with *Graphium ulmi* on Elms and other deciduous trees.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 11, p. 89, 1931.

The occurrence of the elm disease due to *Graphium ulmi* was favoured in Germany by the heat wave in the summer of 1931. Not only were the symptoms more pronounced, but the percentages of infection resulting from inoculation experiments were uniformly higher than in the previous year. External symptoms of infection by *G. ulmi* were observed for the first time in *Ulmus vegeta* [*R.A.M.*, x, p. 213] and *U. alba* which had hitherto shown only a slight discoloration of the sapwood. The supposedly resistant Asiatic varieties, *U. pumila* and *U. pinnato-ramosa* [ibid., x, p. 695], also exhibited the latter symptom, so that a definite state-

ment on the reaction of these varieties to *G. ulmi* would as yet be premature.

Inoculation experiments on lime (*Tilia parvifolia*) with *G. ulmi* resulted in a typical wilting resembling that caused by *Verticillium albo-atrum* [cf. ibid., ix, p. 5]. In twelve other kinds of deciduous trees, viz., *Acer pseudoplatanus*, *A. platanoides*, *A. negundo*, alder, birch, *Sorbus* [*Pyrus*] *aucuparia*, oak, beech, poplar, ash, *Celtis australis*, and *C. occidentalis*, a more or less extensive penetration of the fungus was observed, but no external symptoms. Reisolation was effected in every case.

KAISER (P.). **Das Ulmensterben.** [The die-back of Elms.]—*Gartenflora*, lxxx, 11, p. 369, 1931.

According to recent statements in a well-known Berlin daily newspaper, all attempts to combat the die-back of elms [*Graphium ulmi*: see preceding abstract] by means of injections or fertilizers must be abandoned as hopeless, and at a meeting of the German Botanical Society the opinion was expressed that the valuable old elm stands throughout Central Europe are doomed to destruction. In the writer's opinion, the bark beetles, *Eccoptogaster* [*Scolytus*] *scolytus*, *E.* [*S.*] *multistriatus* and *E.* [*S.*] *laevis* are the primary agents of the injury [*R.A.M.*, xi, p. 138], *G. ulmi* occurring merely in a secondary capacity.

BAXTER (D. V.) & GILL (L. S.). **Deterioration of the Chestnut in the southern Appalachians.**—*U.S. Dept. of Agric. Tech. Bull.* 257, 21 pp., 4 pl., 4 figs., 1931.

The results of the investigation during four years [details of which are given] of the natural decay in chestnut trees (*Castanea dentata*) killed by blight (*Endothia parasitica*) in the southern Appalachians [*R.A.M.*, x, p. 276] showed that the sapwood of the trees is largely rotted by the fifth year after death, while the dead heartwood, both standing and felled, remains sound for many years. As a general rule timber from dead trees left standing for one year is practically as good as that from living trees for the manufacture of treated poles, and industrial wood may be obtained from chestnut trees for at least four years after their death.

In giving a brief account of the chief fungi found decaying chestnut slash in the forests, it is pointed out that some of these organisms, e.g., *Polystictus pergamenus* [ibid., ix, p. 432] and *Polyporus gilvus* [ibid., ix, p. 216] also actively destroy the sapwood of standing trees; *P. spraguei* [ibid., vi, p. 702], *P. sulphureus*, and, in some of the northern districts of the Appalachians, *Daedalea quercina* destroy the heartwood both of standing trees and felled logs. The fact that *P. pilotae* [ibid., ix, p. 216] was recovered in a viable condition from dead trees left standing for 12 years or more indicates that besides causing a heart rot of living chestnuts, this fungus may continue to decay the wood even after the death of the tree. Other common fungi on chestnut slash in the forests are *Polystictus hirsutus* [ibid., x, p. 217] and *Polyporus* [*Polystictus*] *cinnabarinus* [ibid., x, pp. 71, 635].

Boyce (J. S.). **The control of White Pine blister rust in the United States.**—*Quart. Journ. of Forestry*, xxv, 4, pp. 305–311, 1931.

In this paper the author briefly reviews the results so far obtained, and the work still to be done in the control of the white pine blister rust (*Cronartium ribicola*) in the United States [*R.A.M.*, xi, p. 143], with particular reference to the eradication of susceptible species of *Ribes*. Special attention is given to the spread of the disease in commercial stands of the western white pine (*Pinus monticola*) and sugar pine (*P. lambertiana*) in the forests of the north-western parts of the States.

Hurst (R. R.). **The nature, cause, and prevention of brown-heart in Turnips.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 176–181, 1 pl., 1931.

No evidence has been obtained that the condition known as brown heart of turnips in Prince Edward Island is of parasitic origin. It probably represents a physiological disturbance within the plant tissues brought about by physical or chemical agencies. There appears to be no reliable external indication of the presence of the trouble, but on cutting across the turnip a well-defined, brownish, mottled, more or less watery area, which never extends past the cambial layer, is visible. Sometimes there are concentric light and dark rings indicating growth periods. As the turnips grow older the brownish discoloration becomes less noticeable, and the mottling may vanish, leaving a greyish-brown, dry, punky mass of dried out and broken down cellular tissue. Turnips affected with brown heart do not rot, though brown heart is frequently confused with the rot due to *Phoma* [*lingam*].

Replies to a questionnaire sent to farmers showed that where manure was used in abundance brown heart was not present, but where no manure was applied 50 to 100 per cent. brown heart developed. It was less severe than usual when the manure was applied in the autumn before seeding time, or when heavy applications of compost were made shortly before seeding. Field experiments indicated that fertilizer and manure combined reduced brown heart development which was favoured, however, by the use of fertilizer alone.

Histological investigations showed that brown heart begins when the plant is in the seedling stage and originates in the lower section of the tap-root. The symptoms appear to be associated with an abnormal development of the xylem vessels.

MacLeod (D. J.). **Resistance of varieties of Turnips to club-root.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 181–182, 1931.

During 1930, 112 commercial varieties and strains of swedes and turnips were tested in New Brunswick for resistance to finger-and-toe (*Plasmodiophora brassicae*). Sixty-nine showed no resistance, 41 varieties showed 20 to 75 per cent. severe infection, and two varieties, White and Aberdeen, developed slight disease in the rootlets. Fifty-nine selections from different commercial

varieties and 41 crosses made in 1929 at the Dominion Experimental Station were also tested. Fifty-three of these selections showed no resistance, and six varieties showed from 30 to 90 per cent. freedom from finger-and-toe. Twenty-five of the crosses showed no resistance, and sixteen of them showed 25 to 100 per cent. freedom from the disease. Selections from the White swede annually tested and re-selected since 1926 were found to be stabilized with a high degree of resistance. A combination of this variety with Bangholm Studsgaard is practically immune from the disease and possesses most of the desirable qualities of the Bangholm Studsgaard.

MacLeod (D. J.). **Determination of the occurrence of biologic forms of Plasmodiophora brassicae.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 25–26, 1931.

Experimental evidence was obtained suggesting the existence of biologic forms of *Plasmodiophora brassicae*, but tests of material from 50 different sources failed to confirm this evidence [cf. *R.A.M.*, xi, p. 16]. It was, however, demonstrated that there are partially resistant lines within certain families of crucifers.

Vestal (E. F.) & Bell (F. G.). **A preliminary study of some environmental factors on the spread of Cercospora leaf spot and yield in checked and drilled Sugar Beets.**—*Amer. Journ. of Botany*, xviii, 9, pp. 705–716, 1 diag., 4 graphs, 1931.

This is an expanded account of the investigations on the comparative value of checking and drilling in the control of leaf spot of sugar beets (*Cercospora beticola*) conducted in Iowa during 1929–30 by the first-named author and I. E. Melhus, an abstract of which has already been noticed [*R.A.M.*, x, p. 427].

Peuser (H.). **Fortgesetzte Untersuchungen über das Vorkommen biologischer Rassen von Colletotrichum lindemuth. (Sacc. et Magn.) Bri. et Cav.** [Continued investigations on the occurrence of biologic strains in *Colletotrichum lindemuth.* (Sacc. et Magn.) Bri. et Cav.]—*Phytopath. Zeitschr.*, iv, 1, pp. 83–112, 6 figs., 1 diag., 1 graph, 1 map, 1931.

Experiments were carried out at Bonn-Poppelsdorf in continuation of those described by Budde [*R.A.M.*, viii, p. 349] with 70 isolations of *Colletotrichum lindemuthianum* from beans from all parts of Germany.

The results [which are fully discussed and tabulated] indicated that the majority of the isolations fall into the collective group previously designated as X. To the known biologic forms A, B, C, D, and E may now be added seven new ones, viz., G, H, I, K, L, M, and N. Form G, from Stöckte, Hanover, is, like A, highly virulent to all the varieties tested. Form H, from Kirchwärden, Hamburg, also proved highly virulent to all varieties except Braune Brech (Terra). Form I (Brunswick) attacked five ordinarily resistant varieties, while form K (Irrhove, near Emden)

was similar except in its inability to infect the normally susceptible Weisse Hinrich Riesen (stringless). Form L, from Dresden, from which form N (Bonn) differed only in cultural characters, caused severe infection on four Wachs varieties, but failed to attack 11 others. Form M (Berlin-Malchow) proved virulent towards Wachs Schlachtschwert, Früheste Nordstern, and Princess (double stringless) whereas the ordinarily susceptible Braune Brech, Bunte Hinrichs Riesen, and Weisse, Hinrichs Riesen (stringless) remained practically immune.

In biomalt agar cultures forms I, G, H, X, M, and N produce a luxuriant, blackish-green mycelium with incipient sporodochia and pseudopycnidia. Forms L and K, on the other hand, produce a more slender mycelium, often remaining hyaline for a long time and turning brownish-green only at the sites of development of the sporodochia and pseudopycnidia, which are formed much more freely than by the preceding strains. Forms X, M, and N grow much more rapidly than the others at the optimum temperature for the fungus of 20° C., whereas at 29° the relative positions are reversed. The conidia of the less virulent strains X, M, N, and L were larger on an average (14·16, 16, 15·2, and 15·6 μ, respectively) than those of the more highly pathogenic G, H, I, and K (12·9, 13·4, 13·6, and 13·02 μ, respectively).

Bean plants from which light was excluded were more severely and rapidly attacked than those normally illuminated. In inoculations at 12° the incubation period was prolonged, but a large amount of infection was sometimes secured, whereas at 28° to 29° normal infection did not take place. Inoculation experiments on 95 commercial bean varieties with a mixture of all the above-mentioned forms indicated that none is sufficiently resistant to serve as a basis for breeding trials.

WOOLLIAMS (G. E.). **Cause and control of field rot of Onions.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 139–145, 1931.

In the spring of 1929, soil severely infected with the organism causing *Fusarium* bulb rot of onions was submitted to treatments with numerous [named] chemicals none of which gave any control of the disease. Some years ago the rot was present only to a slight extent in the principal onion-growing locality in British Columbia, but as the Yellow Globe Danvers variety, which is that principally grown there, has proved to be quite susceptible, the disease has spread extensively, and now causes losses ranging up to 15 per cent.

Tests of the susceptibility of 86 [named] onion varieties [the results of which are tabulated] were conducted, and it was found that nine varieties showed no or under 1 per cent. infection, and twenty-three varieties showed 1 to 4 per cent. infection. Of all the varieties tested, Yellow, White, and Red Bermuda onions appeared to be the only ones which consistently showed resistance. Leeks (*Allium porrum*) and chives (*A. schoenoprasum*) were apparently immune; White or English Welsh onion (*A. fistulosum*) remained unaffected, but Red or French Welsh onion showed about 7·5 per cent. infection.

RICHARDSON (J. K.). **Celery heart rot.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 134–137, 1 fig., 1 graph, 1931.

The first abnormal condition observed in celery affected by heart rot or black rot [*R.A.M.*, iv, p. 592; viii, p. 758] in Ontario is the formation of necrotic areas at the tips and margins of the young heart leaflets. As the disease progresses, this necrosis increases until the entire leaves are affected, the disintegration then descending through the stalks and rotting the heart; only the outer leaves remain unaffected.

Most of the isolations from diseased tissues revealed the presence of a soft-rotting bacterium but some gave pure cultures of an unidentified fungus. Tests with these, however, and also in growing celery in soil perpetually moist and in soil alternately moist and dry gave negative results.

MALLAMAIRE (A.). **L'extension de la maladie des taches brunes de l'Arachide en Afrique Occidentale Française et au Cameroun.** [The spread of the brown spot disease of Groundnuts in French West Africa and the Cameroons.]—*Agron. Colon.*, xx, 164, pp. 37–39, 1931.

In French West Africa groundnuts have in recent years become much more widely attacked by *Cercospora personata* [*R.A.M.*, vii, p. 305] than was formerly the case. In 1913, the disease was recorded from the French Congo but was said not to occur in Senegal, where, however, it was found in 1924, and was reported to be recurring annually in 1927. In the Cameroons the disease is about as prevalent as in Senegal, and in both districts it may cause losses up to 15 or 20 per cent. of the crop. For purposes of control the author suggests the burning of diseased husks, disinfection of the seed, and especially the development of resistant varieties.

CLAYTON (E. E.). **Vegetable seed treatment with special reference to the use of hot water and organic mercurials.**—*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 183, 43 pp., 6 figs., 1931.

This bulletin summarizes the results [some of which have already been noticed from another source: *R.A.M.*, x, p. 396] obtained in the investigation, during nine years, of the effects of various methods of seed disinfection, more particularly by the hot water method and by organic mercury preparations, on the viability of the seed of vegetable crops, and on the density of the stands raised from the treated seed. It was conclusively shown that the stimulation of growth which has been claimed to result from some of the mercury and copper compounds is not a constant effect even under greenhouse conditions and is of no practical value in the field. Liquid mercury compounds had a very detrimental effect on the viability of certain seeds (especially Lima beans [*Phaseolus lunatus*]), although in some greenhouse experiments they gave marked control of damping-off. Organic mercury dusts, on the other hand, did not affect injuriously the germination, immediate or delayed, of the seeds tested, and may therefore be safely used

at any time in advance of sowing. The organic mercury preparations were of special value in protecting the germinating seed from decay in the soil, while copper compounds came next in value in this respect. Injury from the hot water treatment was greatest with seeds of low vitality, and was proportionate to the severity of treatment. For safety this treatment should only be used on seed of good viability and not too far ahead of sowing. The addition of aluminium sulphate or zinc sulphate to the hot water in some cases prevented part of the delayed injury from the treatment.

[A more popular version of this paper is published as *Bulletin* 597.]

STRAŇÁK (F.), BLATTNÝ (C.), & KLEČKA (A.). **Mosaika Revy vinne. (Předběžné sdělení).** [Mosaic of the Vine. (Preliminary report).]—*Ochrana Rostlin*, xi, 3–4, pp. 89–98, 1931. [French summary.]

In giving a fuller morphological and histological description of the vine mosaic previously briefly described by Smolák from Mělnik, Czecho-Slovakia [*R.A.M.*, xi, p. 157], the authors state that the disease is of over forty years' standing in that locality, but has not yet been authoritatively reported from any other part of the country. Investigations during the last five years have shown that the disease only attacks varieties of the European vine (*Vitis vinifera*), none of which has so far been found to be immune from it; in some varieties, however, it is present in a latent form, and is only revealed when a more susceptible variety is grafted on the carrier, in which case the symptoms sometimes are aggravated, suggesting an intensification of the virulence of the active agent by passage through the tolerant host. Attempts to transmit it to plants outside the genus *Vitis* have so far failed, but it appears to have some affinities with certain other mosaics, especially that of the raspberry.

Experiments have indicated that this mosaic is readily transmissible by grafting, by injections of diseased juice into healthy stocks, through wounds in the aerial or underground organs, especially by pruning tools during the vegetative period, and by certain sucking insects, e.g., *Lecanium corni* and aphids. It is not, however, present in, or transmissible through, the soil.

The spread of the disease in the vineyards of Mělnik is stated to have been practically checked (eight new infections in 1931, as against 600 in 1929) by strict control measures, such as the immediate removal of all vine stocks showing the first signs of infection, suppression of sucking pests, and careful disinfection of pruning tools when passing from one plant to the next.

It is pointed out that the Mělnik mosaic presents some features in common with other virus diseases of the vine, more particularly 'roncet' [ibid., x, p. 158; xi, p. 28] from which it differs, however, by very distinct symptoms, though in one case, in which it was transmitted to an American vine stock, there was a certain similarity. Definite cases of 'roncet' have recently been established in Czecho-Slovakia, and all attempts to break up the virus causing this disease into two or more entities, one of which would produce the Mělnik form, have given negative results. The inference,

therefore, is that the Mělnik mosaic is due to a special virus, the true nature of which has still to be investigated.

Pollacci (G.). **Rassegna sull'attività del Laboratorio Crittogamico di Pavia (Osservatorio Fitopatologico per le provincie di Cremona, Parma, Pavia e Piacenza) durante l'anno 1930.** [Report on the activity of the Cryptogamic Laboratory of Pavia (Phytopathological Observatory for the provinces of Cremona, Parma, Pavia, and Piacenza) during the year 1930.] —*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, ii, pp. 271–285. 1931.

After a general account of the work of the Cryptogamic Laboratory, Pavia, during 1930, a list is given, arranged under hosts and including numerous human and animal pathogens, of the diseases identified in the course of the year, among which may be cited *Bacillus baccarinii* on vine branches, *Sporotrichum persicae* on peach fruits, *Cytospora rubescens* on peach stocks, and *Fusarium lateritium* [*Gibberella moricola*: see below, p. 306] on mulberry branches. Necrosis of pear branches observed in Mantua, Rimini, and Como is attributed to *B. amylovorus*, but no mention is made of the isolation of the organism [*R.A.M.*, v, p. 208].

Trabajos de las estaciones de fitopatologia agricola en el año 1930. [Work of the Stations of Agricultural Phytopathology in the year 1930.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 137–166, 1931.

Lists are given of the principal plant diseases investigated at the Spanish Phytopathological Stations during 1930 [cf. *R.A.M.*, x, p. 160]. Among other items of interest the following may be mentioned. *Fusarium oxysporum* f. 3 [which Wollenweber regards as the correct name for *F. cubense*: ibid., x, p. 626] was isolated from diseased bananas in the Orotava Valley, Teneriffe, this being the first definite record of the rot in the vicinity of Europe [but see ibid., v, p. 374]. A species of *Cephalosporium* was also isolated from the infected fruit.

The study of the so-called 'whitewash' disease of chillies [*Capsicum annuum*] in Valencia and Catalonia was continued. The plants were found to be attacked by *Oidiopsis sicula* [ibid., viii, p. 756], probably the conidial stage of *Leveillula taurica*, while *Cercospora capsici* Unamuno [cf. ibid., ix, pp. 135, 613; x, p. 777] was also observed, the latter being of interest as the first record [in Spain] of the genus *Cercospora* on chillis.

Prissyajnyuk (A. A.). **Материалы по изучению грибных заболеваний полевых культур Нижне-Волжского края.** [Contributions to the study of fungous diseases of field crops in the Lower Volga region.]—*Plant Protection*, Leningrad, vii, 4–6, pp. 323–337, 1931.

In this paper the author gives a preliminary report of his observations during the 1929–30 season on the relative resistance of cereal varieties to fungous diseases in the experimental fields of the Saratoff Seed Selection Station in the Lower Volga basin. Loose smut (*Ustilago tritici*) only occurred on spring-sown wheats,

among which all belonging to the *durum* group were highly resistant or immune. Of the soft (*vulgare*) wheats the highest resistance was exhibited by the *erythrospermum*, *milturum*, and *caesium* varieties. The resistance of these varieties is correlated with the fact that their flowers remain closed during the whole flowering period, or open late, after the grain has set, this allowing the latter to escape infection by the smut spores. All the spring-sown *durum* wheats were also very resistant to brown rust (*Puccinia triticina*), but good resistance was also shown by most of the *vulgare* wheats. There were clear indications that in this region winter wheats suffer less from the disease than the spring-sown and that among the latter the earlier sowings show less infection than the later ones. Among the diseases of rye the most prevalent was leaf blotch (*Marssonia secalis*) [*Rhynchosporium secalis*: *R.A.M.*, x, p. 625] on spring-sown crops, and ergot (*Claviceps purpurea*) was also abundant locally. In one nursery a rot of oat panicles before emergence from the sheaths was caused by an undetermined species of *Fusarium*; the disease was especially severe during very hot weather.

Among other crops sunflower (*Helianthus annuus*) suffered from a dry rot of the maturing seeds in the inflorescence, caused by *Rhizopus nigricans*, and from a bacterial leaf spot causing a premature wilting of the foliage. A serious seedling blight of lentils was caused by an unnamed species of *Fusarium*.

Uppal (B. N.). **Appendix I. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1930–31.**—*Ann. Rept. Dept. of Agric. Bombay Presidency for the year 1930–31*, pp. 209–213, 1931.

The fungus causing powdery mildew of *Cuminum cyminum* in the Bombay Presidency is thought to be probably an undescribed species of *Oidium* [cf. *R.A.M.*, x, p. 362]. It is characterized by a branched, hyaline, septate mycelium, 4 to 6·5 μ in diameter, forming a dense, greyish-white coating on all the green parts, especially the seed; septate, erect, moderately thick, single, hyaline conidiophores, 106·5 to 166·5 μ in length; and hyaline, rounded cylindrical, catenulate conidia, falling off at maturity and measuring 35 to 40·9 by 13 to 16·9 μ. Very good control of the disease was obtained over an area of 2·75 acres by dusting with sulphur, the first application being given just before flowering and the second at the time of seed formation. The total cost of the treatment is Rs. 5 [7*s.* 6*d.*] per acre. The pathogenicity of a species of *Macrosporium* isolated from *C. cyminum* has been demonstrated.

Further experiments in the control of fig rust [*Kuehneola fici*: ibid., x, p. 585] by sulphur dusting indicated that the best results are given by four to five applications at four- or five-week intervals, the first being made not later than 15 days after the first watering and the last not later than the end of February, though if necessary a light application may be given in March. The amount of 200-mesh sulphur dust required to treat an acre (200 trees) ranges from 50 to 65 lb.

A species of *Fusarium* has been shown to cause a wilt of sunn hemp [*Crotalaria juncea*: ibid., xi, p. 107], some varieties of

which gave evidence of resistance to the fungus in pot and field trials.

The best control of betel vine [*Piper betle*] wilt (chiefly caused by *Phytophthora* sp. during the monsoon while *Sclerotium rolfsii* does some damage in the dry season) was given by Bordeaux mixture, applied at the rate of 1 gall. per 12 ft. row before the vines were lowered and at 2 galls. after this operation [ibid., xi, p. 158].

Evidence has been obtained that *Sclerospora maydis* is synonymous with *S. philippinensis* [ibid., vii, p. 303; ix, p. 319].

Briton-Jones (H. R.). **Trinidad plant diseases. Notes on some diseases of main crops in Trinidad.**—*Trop. Agriculture*, viii, 11, pp. 300–302, 1931.

In this paper notes are given on some of the more important diseases of economic crops in Trinidad, including black pod and canker of cacao caused by *Phytophthora palmivora* [*R.A.M.*, ix, p. 20] (stated to be the cause of the heaviest losses to this crop in the island); bronze leaf wilt of coco-nut palms [ibid., ix, p. 238]; mosaic and root diseases of sugar-cane; and brown eye spot (*Cercospora coffeicola*) [ibid., x, p. 659], viruela or American leaf disease (*Omphalia flavida*) [ibid., ix, p. 437], and *Sclerotium coffeicolum* [ibid., ix, p. 650] on coffee. Wither-tip (*Gloeosporium limetticolum*) [ibid., x, p. 160] of lime is so general in Trinidad as to have inflicted a serious check on the cultivation of this tree. Young plants of sour orange [*C. aurantium* var. *bigaradia*] in nurseries are severely attacked by scab (*Cladosporium* [*Sporotrichum*] *citri*) [ibid., x, p. 654] in several parts of the Island; they are not killed, but their growth is markedly retarded by the disease.

Reports of the Agricultural Department, Dominica, 1929–30 and 1930–31.—*Trinidad, Imper. Comm. of Agric. West Indies*, 51 pp., 1 fig., 1931.

So great was the damage caused to limes in Dominica in 1928 by a hurricane even worse that that experienced two years previously, that red root disease (*Sphaerostilbe repens*) [*R.A.M.*, ix, p. 20] spread exceedingly rapidly, and it soon became evident in the Island that the seedling lime was doomed. During 1929–31, the disease has continued to cause serious loss, and exports of lime products are expected to fall further until recent plantings of the lime grafted or budded on stock resistant to disease and to uprooting by hurricanes come into bearing. In the Department's nurseries, seedling limes grown for grafting succumbed at a very early age to root diseases, before they had become affected by hurricanes or grub attacks, and in one locality where seedling limes and sour oranges [*Citrus aurantium* var. *bigaradia*] were planted on infected land all the lime seedlings died, although the sour oranges appeared to thrive.

One instance of witches' broom of lime (probably caused by *Sphaeropsis tumefaciens*) [ibid., ix, p. 63] was observed, characterized by hard, woody enlargements of the nodes and hypertrophy of the buds.

Citrus scab [*Sporotrichum citri*] caused considerable trouble in sour orange nurseries in 1929–30, and in February, 1931, assumed alarming proportions in one nursery. Repeated spraying with Bordeaux mixture 5–5–50 was necessary to keep the disease under control.

Of the many citrus varieties resistant to wither-tip [*Gloeosporium limetticolum*: ibid., viii, p. 776] which have been introduced by the Agricultural Department, Bears' seedless, Tahiti, and the Woglum lime most closely approximate to the characteristics of the West Indian lime, so far as the fruits are concerned. The Woglum lime has proved to be a heavy bearer on the sour orange stock and is the most sought-for variety in wet districts. The fruits are larger than those of the West Indian, but the acid content is high and the juice flavour very similar to that of the West Indian lime. About 50 per cent. of the hybrids raised by crossing *Citrus aurantifolia* and the Woglum lime with the West Indian lime appear to be quite useless, but tests made with a few promising Aurantifolia crosses indicated that the acidity was well up to standard.

Department of Botany and Plant Pathology.—*Ann. Rept. Virginia Agric. Exper. Stat. for the period July 1, 1927, to June 30, 1931*, pp. 28–34, 1931.

This report on phytopathological work conducted by F. D. Fromme and S. A. Wingard, with the assistance of G. M. Shear, R. G. Henderson, A. B. Groves, and R. H. Hurt, contains the following among other items of interest. Studies on black root rot of apple [*Xylaria mali*: *R.A.M.*, vii, p. 645] have been in progress for the last 14 years, during which time no stock showing immunity from the disease has been observed, though varying degrees of resistance were noted. Some promise of control has been given by soil sterilization with steam.

In connexion with an investigation on bean [*Phaseolus vulgaris*] rust [*Uromyces appendiculatus*: ibid., x, p. 810] which has been in progress since 1917, crosses have been made between the Navy and Improved Goddard, and the Kentucky Wonder and Marblehead Pole varieties, with encouraging results. Rust resistance was found to be a dominant factor in beans, all the F_1 plants possessing this character. In the second generation segregation of the characters for resistance and susceptibility occurred more or less in accordance with Mendel's law.

Infection by tobacco ring spot has been secured on 37 different genera of plants distributed among 17 families [ibid., xi, p. 132]. In 1929 95 per cent. of the tobacco acreage in Washington County showed ring spot, up to 90 per cent. of infection occurring in certain fields, while the average amount was estimated at 8 per cent., which would probably cause about 1 per cent. decline in yield. About 64,500 tobacco seedlings grown from diseased seed were observed, and not one developed any symptoms of ring spot.

Twenty-ninth Annual Report of the Bureau of Science, Philippine Islands, for the year ending December 31, 1930.—pp. 801–889, 1931.

Among the items of phytopathological interest in this report

the following may be mentioned. *Cinchona* suffered from a disease involving the girdling of the branches or even of the main trunk by cankers, the cause of which is still obscure.

The tomato disease known in the United States as southern blight (*Sclerotium rolfsii*) was found causing damage in eight districts including Laguna and Batangas [*R.A.M.*, vi, p. 584].

Studies were conducted on the virus diseases of pechay [*Brassica pekinensis*], Chinese radish, mustard, turnip, watermelon, and sincama [*Pachyrrhizus angulatus*].

LAYCOCK (T.). **Experiments on the fermentation and moulding of Cacao.**—*Ninth Ann. Bull. Agric. Dept. Nigeria, 1st August, 1930*, pp. 5–26 [? 1930. Received February, 1932.]

The results [which are discussed and tabulated] of experiments on cacao fermentation conducted in Nigeria during the seasons 1928–9 and 1929–30 [cf. *R.A.M.*, viii, p. 296] indicated that the exclusion of purple beans from the prepared product can only be effected by the use of very mature beans or by unduly protracted fermentation. However, since over-ripe beans are usually germinated, while over-fermented ones are dark, very brittle, and may be affected by internal moulding due to *Aspergillus glaucus*, *A. fumigatus*, *A. tamarii*, and *A. sydowi* [ibid., ix, pp. 162–164, 309], it appears that no rational method of fermentation will prevent the occurrence of some purple beans in ordinary cacao. On the other hand, freedom from insufficiently fermented beans can be obtained by practically any of the ordinary methods of fermentation [details of which are given]. Collapsed beans, which are of frequent occurrence in cacao samples, are stated to be due to very rapid drying of well-fermented cacao during the first day.

Exportable dry cacao from the Ibadan district, when passed by the Produce Examiners, generally has such a low moisture content (not exceeding 8 per cent.) that the risk of subsequent moulding is almost negligible. It was shown by experiments that the fungi responsible for internal moulding enter the bean through the micropyle. In one case beans having the micropylar end covered with a toxic cement, consisting of necol (a celluloid varnish) mixed with finely powdered copper sulphate and mercuric chloride, showed only 10 per cent. internal moulding as compared with 76 per cent. in a corresponding lot with the micropylar end exposed to infection. In a sample entirely covered with the cement there was complete freedom from moulding. In another test, beans were partially embedded in paraffin wax, one lot with the micropyle covered and another with it exposed. The beans were then sprayed with a spore suspension of *A. flavus* and the percentages of internal moulding which subsequently developed were 39 and 88, respectively.

PRISSYAJNYUK (A. A.). Новая бактериальная болезнь Пшеницы, „блэк-чаф" в Нижне-Волжском крае. ['Black chaff', a new bacterial disease of Wheat in the Lower Volga region.]—*Plant Protection*, Leningrad, viii, 3, pp. 305–307, 1 fig., 1931.

The author states that although black chaff of wheat was recorded for the first time in the Lower Volga basin in 1929, there is

evidence that the disease is of much longer standing in that area. Isolations from diseased material showed that the disease is caused by *Bacterium translucens* var. *undulosum* [*R.A.M.*, xi, p. 163], a very brief account of which is given, based on American investigations. The disease in the Lower Volga region only attacks winter wheats, in susceptible varieties of which the incidence varied from 15 to nearly 62 per cent., while others appeared to be highly resistant or immune. Besides disinfection of the seed-grain with 0·01 per cent. mercuric chloride, the best means for the control of black chaff is considered to be the use of grain originating from disease-free crops, as infection was proved to be seed-borne, and also avoiding the application to cereal fields of manure from cattle fed on black chaff straw ; such cattle should not be allowed to graze or even work on land destined for cereal crops.

Shitikova-Roussakova (Mme A. A.). Влияние воздушных течений на появление и развитие ржавчинных эпидемий в различных районах Союза. [The effect of air currents on the appearance and development of rust epidemics in various regions of U.S.S.R.]—*Plant Protection*, Leningrad, vii, 4–6, pp. 361–363, 1931.

In this note the author briefly summarizes the information on the appearance and spread of cereal rust epidemics [*Puccinia* spp.] in various parts of European and Asiatic Russia obtained through the investigation of the fungal flora of the air by means of aeroscopes [*R.A.M.*, viii, p. 763; ix, pp. 440–442, *et passim*]. She points out the practical importance of this study in field tests of cereal varieties for resistance to rusts, since the absence of spores of a given rust form in the air at the time when the crops are susceptible to it, which can only be established by a careful examination of the atmosphere, may lead to the erroneous conclusion that the varieties tested are resistant to that form. Periodical examinations of the air may also be used to determine the most propitious time to carry out the dusting of the cereals with sulphur by aeroplanes for the control of the rusts.

Greaney (F. J.). **Sulphur dusting for the prevention of cereal rusts.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 61–66, 2 figs., 1931.

During 1930, further field trials were conducted in Manitoba for the control of stem and leaf rusts of wheat [*Puccinia graminis* and *P. triticina*] by sulphur dusting [cf. *R.A.M.*, x, p. 587 ; ix, p. 196], thirty acres of Marquis wheat on one farm being given 30 lb. of kolodust per acre at five-day intervals from 16th July until 1st August by means of a horse-drawn Niagara 'Aero' duster, and ten acres on another farm receiving identical applications from a Niagara self-propelled power duster. On the first farm the dusting increased the yield by 16 bushels per acre and raised the grade from no. 3 to no. 1 Northern, while on the second farm the yield was increased by 6·2 bushels per acre and the grade raised from no. 2 to no. 1 Northern. The cost of the treatment (about $5 per acre) was sufficiently low to yield a very good margin of profit.

The results of co-operative field experiments conducted during 1930 to devise a satisfactory wheat dusting schedule are tabulated. In three localities the best rust control was given by nine to eleven applications of kolodust made twice weekly at the rate of 20 lb. per acre. On two farms this treatment increased the yield by 18 bushels per acre. Six weekly dustings of 40 lb. per acre increased the yield by 15·5 bushels per acre.

Aeroplane sulphur dusting [cf. ibid., vii, pp. 368, 566] with the specially designed Keystone Puffer machine was applied to 428 acres of Marquis wheat, part of each field (totalling 286 acres) being left untreated. The [tabulated] results show that stem rust was markedly reduced, the percentage infection in one field, for example, falling from 55 to 10 per cent. with an increased yield of 10·1 bushels per acre after five applications of 20 lb. per acre. The quality of the grain remained, however, unaffected. Leaf rust was not satisfactorily controlled, and in most of the fields the gain represented by the improved yield and grade did not cover the cost of aeroplane dusting.

JOHNSON (T.). **Studies in cereal diseases. VI. A study of the effect of environmental factors on the variability of physiologic forms of Puccinia graminis tritici Erikss. and Henn.** —*Canada Dept. of Agric. Bull.* 140, N.S., 76 pp., 10 figs., 7 graphs, 1931.

A detailed account and discussion is given of experiments at the Dominion Rust Research Laboratory, Winnipeg, to determine the effect of environmental factors (only two of which, namely, temperature and carbon dioxide concentration in the atmosphere, were studied under controlled conditions) on the development of certain physiological forms of *Puccinia graminis tritici* on Stakman's and Levine's twelve differential varieties of wheat [*R.A.M.*, ii, p. 158]. The physiological forms tested included forms 11, 17a, 29, 32, 38, 48, 76, 82, 85, 87, 89, 90, 91, and 92, which had previously been found to produce an X-reaction [ibid., xi, p. 33] on certain of the differential hosts. It was shown that at a temperature of about 60° F. and at a low to moderate light intensity, these varieties are immune from the rust, while at about 75° and the same light intensity they are completely susceptible [cf. ibid., xi, p. 231]. The reaction of the hosts was also gradually shifted towards susceptibility by increased intensity of light, temperature, and other conditions remaining constant. It is pointed out, however, that this effect is confined to the reaction of certain of the wheat varieties to some of the physiological forms, since the same varieties when infected by other forms do not show this response. As measured by its effect on the production of the X-reaction, carbon dioxide at concentrations varying from 0·03 to 4·5 per cent. did not exert any stimulating effect on the development of the rust; the higher concentrations appeared to affect adversely, but not to inhibit this development. Experiments to test the effect of mineral starvation of wheat seedlings on the development of the rust, with particular reference to the production of the X-reaction, showed that this factor did not seem to influence the type of infection, although infections

were less numerous on seedlings grown in solutions deficient in some of the mineral salts [cf. ibid., xi, p. 98].

A separate section of this paper deals with the effect of temperature on the formation of the teleuto stage of *P. graminis tritici* and on the germination of the teleutospores produced in the greenhouse; the results of this work have already been noticed from another source [ibid., xi, p. 230].

GASSNER (G.). **Das Standardsortiment zum Nachweis der physiologischen Spezialisierung des Weizenbraunrostes, Puccinia triticina Erikss.** [The standard varieties used for the recognition of physiologic specialization in the brown rust of Wheat, *Puccinia triticina* Erikss.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 4, pp. 403–406, 1931.

Scheibe's substitution of the American wheat variety Michigan Amber for Turkey 47 as a differential for the recognition of physiologic specialization in brown rust (*Puccinia triticina*) [*R.A.M.*, ix, p. 767] is stated in a letter from Prof. Johnston to be based on a misunderstanding. The Michigan Amber 29–1–1–1 seed was sent to Scheibe by Mains as a susceptible variety upon which to grow stock cultures of the rust, but Scheibe assumed that it was identical with Turkey 47, the reactions of which to the first 12 physiologic forms of *P. triticina* (except XI) were accordingly assigned to Michigan Amber. However, since the reactions of the latter variety to the first 12 physiologic forms are unknown, and since it has been shown by Scheibe to be susceptible to all his collections of leaf rust, its use for differential purposes does not seem advisable. In the same communication Prof. Johnston states that the hitherto unnamed varieties C.I. 3756, 3778, 3779, and 3747 are to be known as Carina, Brevit, Loros, and Similis, respectively. The last-named has been found to be identical with Webster C.I. 3780, while Norka C.I. 4377 is the same as Malakoff C.I. 4898, so that Similis C.I. 3747 and Norka C.I. 4377 will be discarded from the list of differential varieties, which now runs as follows: Malakoff C.I. 4898, Carina C.I. 3756, Brevit C.I. 3778, Webster C.I. 3780, Loros C.I. 3779, Mediterranean C.I. 3332, Hussar C.I. 4843, and Democrat C.I. 3384.

TSCHOLAKOW (J. W.). **Ein Beitrag zur physiologischen Spezialisierung des Weizenbraunrostes, Puccinia triticina Erikss.** [A contribution to the physiologic specialization of brown rust of Wheat, *Puccinia triticina* Erikss.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 4, pp. 407–411, 1931.

Six biotypes of brown rust of wheat (*Puccinia triticina*) were isolated, by using the revised standard wheats [see preceding abstract] from 13 collections (4 from Germany, 1 each from Holland and Austria, 4 from Hungary, and 3 from Bulgaria [*R.A.M.*, xi, p. 33]. Of these, forms XI, XIII, XIV, XVII, and XX were already known, while one (XXV from Budapest) is new.

Generally speaking, the writer's observations as to the distribution of the different physiologic forms of *P. triticina* confirm those of Scheibe, but a few discrepancies have arisen. Thus, forms XI and XIV, referred by Scheibe to western Europe, were found by

the writer to predominate in the east. Forms XIII, XVII, and XX appear, both from the present investigations and those of Scheibe, to be confined to eastern Europe, but it seems doubtful whether a rigid line can be drawn between the eastern and western groups of biotypes.

VANTERPOOL (T. C.). **Cultural and inoculation methods with Tilletia species.**—*Science*, N.S., lxxv, 1931, pp. 22–23, 1932.

Since 1925 the writer has used the double or inverted plate method described by Bodine [*R.A.M.*, xi, p. 169], or modifications thereof, in the culture of other species of *Tilletia* besides *T. tritici* and *T. levis* [*T. caries* and *T. foetens*], as *T. horrida* [see below, p. 324], *T. holci*, and *T. asperifolia* were found to discharge their secondary conidia in a manner similar to that described by the writer and A. H. R. Buller (*Nature*, cxvi, p. 934, 1925) for *T. caries* and *T. foetens*. By this method monospore cultures of secondary conidia can be obtained and hybridization experiments conducted with a fair degree of facility. The method has further been adapted to the multisporous inoculation of germinating wheat seedlings by inverting a vigorously growing culture of *T. caries* or *T. foetens* and allowing secondary conidia to 'rain down' on the seedlings during the first two or three days of germination. Infection was favoured by a temperature of 10° to 14° C., and probably also by darkness. At maturity a large percentage of the seedlings were found to have developed bunted heads.

HANNA (W. F.) & POPP (W.). **The control of bunt of Wheat by seed treatment.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 68–69, 1931.

After discussing the prevalence of bunt of wheat (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] in western Canada [*R.A.M.*, x, p. 444], the authors describe control tests against the disease carried out at Winnipeg.

With seed inoculated with the spores of *T. caries* (1 part of spores to 200 parts of seed by weight) the highest percentage of bunt occurred in the untreated control rows; sprinkling the seed with formalin solution 1 in 320 gave better control than any of a large number of [named] dusts applied at the rate of 2 oz. per bushel of seed. When, however, only 1 part of spores per 1,000 of seed was used, copper carbonate dusts, monohydrated copper sulphate dust, ceresan, and vitrioline [ibid., viii, p. 299] were more effective than formalin. In another locality the formalin treatment, copper carbonate, monohydrated copper sulphate dust, and ceresan were all about equally efficacious.

HANNA (W. F.) & POPP (W.). **Control of loose smuts of Wheat and Barley by seed treatment.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 70–72, 1931.

Complete control of loose smut of wheat (*Ustilago tritici*) [*R.A.M.*, x, p. 509] in Manitoba was given in experimental trials by either of the following hot water treatments of seed of the Reward variety: (1) presoaking for 4 hours, followed by dipping

for 10 minutes in water at 125° to 135° F.; (2) soaking for 1 hour 50 minutes at 118·5°; and (3) soaking for 1 hour 35 minutes at 120°. When immersed for 10 minutes at 129° few, if any, of the seeds were killed, serious injury beginning, apparently, at temperatures above 130°.

DAVYDOFF (P. N.). Новый способ протравливания семян. [A new method of seed disinfection]—*Plant Protection*, Leningrad, viii, 4, pp. 415–420, 1 fig., 1931. [English summary.]

A brief description [together with a sectional drawing] is given of a machine devised by the author for the disinfection of seeds by formalin vapour, which is claimed to give particularly good results in the control of cereal smuts. The seed-grain is fed into a perforated, slightly conical, and slowly revolving cylinder, where it is exposed to the action of the vapour generated by boiling a weak solution of formalin (1 part 40 per cent. in 100 parts water). Preliminary experiments showed that the length of exposure (from 1 to 10 minutes) is not material, but that the grain, after treatment, must be covered with tarpaulins for one or two hours, after which, unless sown immediately, it should be thoroughly ventilated before storing in clean bags.

The treatment is most economical and is stated not to impair the germinability of the seed-grain. The method, for which the machine described above is designed, has been tested since 1926 in four widely separated areas of European and Asiatic Russia, and in every case has given efficient control of oat smut [*Ustilago avenae*] and wheat bunt [*Tilletia caries* and *T. foetens*].

BOGOYAVLENSKY (A. A.). Испытание порошкообразных фунгицидов в борьбе с головней хлебов. [Tests of dust fungicides for the control of cereal smuts.]—*Plant Protection*, Leningrad, vii, 4–6, pp. 371–375, 1931.

Brief details are given of experiments in 1928 at the Bashkir [Southern Urals] Plant Protection Station on the control of cereal smuts by means of disinfection of the seed-grain with various dust fungicides. Of all the preparations tested, effective control of wheat bunt [*Tilletia caries* and *T. foetens*] was only obtained with Paris green (at the rate of 0·5 gm. per kg. grain), copper carbonate (3 gm.), a mixture of wood ash with anhydrous copper sulphate (4 gm.), and sodium arsenate (1 gm.); and of oat smut [*Ustilago avenae*] with Paris green (2 gm.) and anhydrous copper sulphate (3 gm.). Formalin gave a slightly better control of these diseases, but the difference was too small to counteract the advantages of the dust disinfection method, which did not exert any injurious or delaying action on the germination of the seed-grain.

YU (T. F.) & CHEN (H. K.). **A Chinese Wheat resistant to flag smut.**—*Phytopath.*, xxi, 12, pp. 1202–1203, 1931.

Tests conducted at Nanking, China, in 1928 and 1929 showed that the wheat selection Nanking 716 and the Australian variety Nabawa (only used in 1929) are immune from flag smut (*Urocystis tritici*) [*R.A.M.*, viii, pp. 369, 454; x, p. 782]. The Chinese selection H. 1102 showed 34·7 and 22 per cent. infection in 1928 and 1929, respectively.

BROADFOOT (W. C.). **Does the Wheat plant become more susceptible to the foot-rotting fungi with increasing age?**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 92, 1931.

In a preliminary test in which pot cultures of Marquis wheat were inoculated at 10-day intervals with pathogenic cultures of *Fusarium culmorum*, *Helminthosporium sativum*, *Ophiobolus graminis*, and *Leptosphaeria herpotrichoides*, singly and in combination evidence was obtained that the wheat plant was more susceptible during the first thirty or forty days than it was later. This was confirmed by a second experiment, the later inoculations being relatively ineffective. Infection was greater when *O. graminis* was used alone than when in combination with the other species [*R.A.M.*, x, p. 719].

RUSSELL (R. C.). **Study of take-all (Ophiobolus graminis) of Wheat. A co-operative crop sequence study for the control of take-all disease of Wheat and for the testing of varietal resistance of Wheat under field conditions.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 78–82, 2 figs., 1931.

A study of the effects of soil moisture upon the severity of take-all of wheat (*Ophiobolus graminis*) [see preceding abstract] in which Marquis seedlings were grown in vessels containing soil at different degrees of saturation, showed on three separate occasions that the incidence of infection decreased with each increase in moisture, the average disease rates for the three experiments being 85 at 30 per cent. saturation, 66 at 45 per cent. saturation, 59 at 60 per cent. saturation, and only 51 at 75 per cent. saturation. Different isolations of *O. graminis* varied markedly in their relative virulence, the new isolation, no. 6, being very virulent.

Tests of the yield of wheat grown in 1930 in plots sown to wheat and artificially inoculated with *O. graminis* in 1927 and 1928, and in 1929 left fallow or sown to wheat, barley, or oats, showed the following results (duplicate series) expressed as percentages, the yield following oats being taken as 100: summer fallow 157 and 154, wheat 59 and 61, and barley 68 and 73.

In tests of varietal susceptibility to *O. graminis* all the wheats experimented with, viz., Garnet, Marquis, Mindum, and Reward suffered heavily, the inoculated rows yielding on an average only 21 to 49 per cent. as much as the controls.

SIMMONDS (P. M.). **A study of the annual fungous flora of the basal parts of the Wheat plant.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 77–78, 1931.

Tables are given showing the percentages of *Helminthosporium sativum*, *Fusarium*, *Alternaria*, and *Rhizoctonia* isolated from the crowns and roots of Marquis and Kubanka wheat in the seedling heading, and stubble stages at Saskatoon, Saskatchewan, in 1930 [*R.A.M.*, x, p. 447], while further tables summarize the total percentages of *H. sativum* and *Fusarium* spp. obtained from the same varieties grown at six widely separated stations.

The total number of fungi isolated from the crowns increased as the season advanced. At nearly all the stations *H. sativum* was isolated more frequently from older plants than from seedlings; whilst species of *Fusarium* did not show the same consistency, being isolated in great numbers from seedlings. *H. sativum* occurred mostly on the crown (up to 64 per cent.) and only occasionally (not more than 2 per cent.) on the root, whereas the percentages for *Fusarium* were 26 to 66 and 32 to 82, respectively. *Rhizoctonia* and *Alternaria* were only occasionally isolated.

SALLANS (B. J.). **A study of the root rot problem of Wheat and Barley caused by Helminthosporium sativum in Saskatchewan.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 82–84, 1931.

In studies of various methods of inoculating wheat with *Helminthosporium sativum* [see preceding abstract] the best results were obtained by inoculating the seed while still immature in the spikelets. Sheaves of Marquis and Kubanka wheat were cut at various stages of maturity from soft to hard dough, and sprayed variously with suspensions of *H. sativum* and *Alternaria* sp., control sheaves being sprayed with water. They were then wrapped in paper and allowed to ripen in the laboratory. Three hundred seeds of each of the treatments of both varieties were then planted in sterile sand in the greenhouse; ten days later, 60 to 86 per cent. of the kernels from the sheaves inoculated with *H. sativum* had become sufficiently infected to cause non-emergence seedling blight, or varying degrees of coleoptile lesioning. Isolations proved that the *Alternaria* was not responsible for any of the lesions.

Greenhouse inoculations of wheat seed with *H. sativum* grown on oat hull mash, in which temperature tanks regulated to 12°, 18°, 24°, and 30° C., respectively, were used, resulted in such marked non-germination and non-emergence that no clear-cut differences were apparent at any of the various temperatures and soil moistures. Slight differences in the very high disease rates indicated that 18° was the most favourable temperature. Variations in moisture ranging from 40 to 80 per cent. of the moisture-holding capacity of the soil produced no noticeable differences in the amount of infection which developed.

A test made to ascertain the effect of inoculation of wheat with *H. sativum* at different dates of seeding (1st and 22nd May and 12th June) showed that the later dates of seeding resulted in much greater infection than the first date. A direct correlation was established between the soil temperatures at the dates of seeding and the amount of damage due to the inoculations. This result suggests the advisability of early seeding to escape serious seedling infection by *H. sativum*.

MEAD (H. W.). **A study of seed troubles in relation to root-rot of cereals.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 84–89, 1 fig., 1 graph, 1931.

In a study of some of the diseases of barley seed in Saskatchewan

the sediment from the washing of 200 seeds from each of 15 samples of barley collected from 12 widely separated localities was examined, with the result that the spores of stem rust [*Puccinia graminis*], leaf rust [*P. anomala*], *Helminthosporium*, *Alternaria*, *Heterosporium*, *Fusarium*, *Ustilago nuda*, *U. hordei*, and wheat bunt [*T. caries* and *T. foetens*] as well as bacteria were found. The rust spores and those of *Heterosporium* and *U. hordei* occurred most frequently. Seedlings grown from the samples, in sterile sand, often bore lesions on the coleoptiles from which *H. sativum* was the fungus most commonly isolated, though *Fusarium* and *Alternaria* occurred as well.

The pathogenicity of some of the fungi isolated from the barley samples was tested in the greenhouse by various methods. *H. sativum* generally produced heavy infection, but only two strains of *Fusarium* caused any appreciable damage to the barley seedlings. *Alternaria* induced some lesioning of the coleoptiles and discoloration of the roots, but the fungus was not recovered from the lesions.

Barley heads inoculated with *H. sativum* [see preceding abstracts] all contained later dark brown seeds, the percentage of discoloration being greatest in inoculations made eight days after flowering, when 84 per cent. of the seeds were discoloured. *Gibberella saubinetii* (from a stock laboratory culture) caused 45 per cent. discoloration of seeds inoculated six days after flowering, the effect resembling that produced by *H. sativum*. The *Fusarium* used caused shrinking of the kernels, with slight darkening. The greatest amount of discoloration at any stage was 60 per cent. at six days. Heads inoculated with *Alternaria* one day after flowering produced 35 per cent. of kernels showing dark grey patches.

Robertson (H. T.). **Histological study of the root-rots of Wheat during the post-seedling stage.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 93–94, 2 figs., 1931.

When the tissue of the culms and roots of foot and root rotted wheat in Alberta was examined histologically evidence was obtained that *Ophiobolus graminis* causes much more serious injury than *Fusarium culmorum* or *Helminthosporium sativum*, and is, apparently, the only one of the three organisms able to penetrate the crown and the endodermis of the roots. Infection of the crown appears invariably to arise from the subcoronal internode and the secondary roots.

A section of a primary root of wheat, thirty days old, which had been inoculated with *F. culmorum* at seeding time, showed the cortex to be disintegrated, though no mycelium was visible; the stele was intact and the wall of the endodermis greatly thickened. A comparable inoculation with *H. sativum* resulted in the cortex being mostly disorganized, and again no mycelium was apparent; peculiar isolated cells in the cortex appeared to be completely plugged with mycelium. With *O. graminis* examination of the culm just above the crown showed mycelium both in the parenchyma cells and in the xylem vessels.

Greaney (F. J.) & Machacek (J. E.). **Root rot survey for Manitoba.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 76, 1931.

In 1930, foot rots caused considerable damage to wheat and barley in Manitoba, the average amount of infection in all the fields examined being estimated at roughly 15 per cent., though in some isolated spots the percentage of infection was much higher. Approximately 1,400 isolations of foot-rotting fungi were made; and out of these the number of isolations of *Fusarium* was more than twice the total number of all the other fungi collected (which included *Helminthosporium* (216 isolations), *Rhizopus* (51), *Mucor* (36), and other genera).

Brown (A. M.). **Investigations of the dwarf leaf rust of Barley (Puccinia anomala).**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 56–57, 1931.

One hundred and fifteen varieties of barley obtained from the Manitoba Agricultural College were tested for susceptibility to four physiologic forms of *Puccinia anomala* [*R.A.M.*, x, p. 231]. Of these varieties, M.A.C. 321, Featherstone, M.A.C. 248, Keystone, Alberta Beardless, Colsess, and Mensury Ottawa 60 showed complete resistance to all four physiologic forms; M.A.C. 406, Nepal, M.A.C. 32, Swedish Gold, M.A.C. 524, Danish Island, and O.A.C. 21 showed resistance to three forms; Sacramento, Mariout, and Californian Baird were resistant to two forms; while Archer Gartons, C.D. 535, Argyle, and Latvia 2-rowed were resistant to only one form.

Robertson (H. T.). **The browning root-rot disease in Alberta.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada, Dept. of Agric.*, p. 94, 1 fig., 1931.

The browning root rot disease of cereals [*R.A.M.*, ix, p. 581] was discovered on oats and wheat near Okotoks, Alberta, in 1930, the root tips of both hosts being found to contain the oospores of a *Pythium*. Wheat, oats, barley, and rye were sown in pots containing unsterilized soil from the infected field of oats, other plants being grown as controls in the same soil sterilized. After sixty days, the roots of the wheat, oats, barley, and rye in the unsterilized soil contained the characteristic oospores of the *Pythium* and showed typical browning symptoms, the wheat being the most seriously affected, while the control plants showed no oospores or browning.

Turner (Dorothy M.) & Millard (W. A.). **Leaf-spots of Oats, Helminthosporium avenae (Bri. and Cav.) Eid.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 535–558, 2 pl., 4 figs., 1931.

This is an expanded version of the first-named author's account of the leaf spot disease of oats in northern England and south-west Scotland, which has already been noticed from another source [*R.A.M.*, x, p. 515]. Besides the information already noted, it contains a brief review of the literature dealing with *Helminthosporium* diseases of cereals, and a morphological description of the British fungus which is identified as *Helminthosporium avenae*

(Bri. and Cav.) Eid. It is closely related to *H. teres*, but some morphological and considerable cultural differences indicate that it is a species distinct from the latter, and, moreover, it is not pathogenic to wheat or barley. The authors were unable to find any analogy between the mode of infection by *H. avenae* and that stated to occur in the smuts; the production of the stripe symptom is due to the coalescence of spots and is not parallel to the attack of *H. gramineum* on barley described by Smith [ibid., viii, p. 770].

O'Brien (D. G.) & Dennis (R. W. G.). **Control of leaf stripe or yellow leaf of Oats.**—*Scottish Journ. of Agric.*, xv, 1, pp. 39–45, 4 figs., 1932.

Excellent control of leaf stripe of oats [*Helminthosporium avenae*: see preceding abstract] is stated to have been obtained in Scotland over an area of 50,000 acres by seed-grain treatment with ceresan. In some cases up to four times as many plants were counted in the treated as in the untreated sections, and attention is drawn to the necessity of reducing the density of sowing by 1 to 2 bushels per acre in order to prevent overcrowding and consequent lodging. The highest increase in yield recorded was 12½ cwt. per acre (Ascot variety), representing a financial gain of about £1 per acre. Apparatus for carrying out the disinfection process may be home-made, while a machine capable of treating 15 cwt. of grain per hour is supplied by Messrs. Watson, Agricultural Engineers, Ayr, at the price of £6. The cost of the ceresan treatment is estimated at 9*d.* to 1*s.* per acre.

Davies (D. W.) & Jones (E. T.). **Grey speck disease of Oats.**—*Welsh Journ. of Agric.*, vii, pp. 349–358, 5 figs., 1 plan, 1931.

Since 1921, grey speck of oats [*R.A.M.*, ix, p. 741; x, p. 490] has been present every year at the Welsh Plant Breeding Station, Aberystwyth. The disease has also been recorded in Cambridgeshire, Warwickshire, Surrey, Yorkshire, and Merionethshire. In Scotland it has occurred frequently on oats in trial plots at the Edinburgh and East of Scotland College of Agriculture.

A test of varietal resistance demonstrated that Scotch Potato oats were highly resistant, Ceirch du bach and Radnorshire Sprig moderately resistant, Victory, Record, Black Tartar, and Golden Rain II moderately susceptible, and Orion highly susceptible.

In 1929, the disease was still provisionally regarded at Aberystwyth as halo blight (*Bacterium coronafaciens*) [cf. ibid., ii, pp. 208, 401], but all attempts to isolate this organism were unsuccessful, and in 1930 the possibility of seed transmission of the disease was tested with entirely negative results.

An experiment is described in which five plots each 8 by 5 ft. were sown with Orion seed on 8th April, 1930. Three days earlier two and a half plots had received a dressing of manganese sulphate, and this dressing was repeated 10 days after sowing, the total amount given being equivalent to 3 to 4 cwt. per acre. The remaining two and a half plots were left untreated. The first signs of grey speck were noted (on the controls only) on 5th June, when the treated plants were more forward, healthier, and darker

than the controls. The treated plants continued to make healthy, vigorous growth, while the controls were mostly shrivelled and brown. The plots were harvested on 1st August.

The [tabulated] data obtained showed that the application of manganese sulphate resulted in an average increased yield of 45 per cent. at harvest and 52 per cent. after drying, while the treated plots also gave a higher grain to straw ratio than the untreated, viz. 54·6 and 50·4 per cent., respectively. The relative weights per 1,000 of grains, kernels, and husks amounted to 33·2, 22·43, and 10·77 gm., respectively, for the treated plot against 29·98, 19·58, and 10·4 for the controls, whilst the corresponding husk percentages were 32·45 and 34·68.

The authors consider that the increased yield is partly due to the beneficial effect of the treatment upon growth before the onset of the disease.

SĂVULESCU (T.) & RAYSS (T.). **Contribution à la connaissance de la biologie de Nigrospora oryzae (B. et Br.) Petch, parasite du Maïs.** [Contribution to the knowledge of *Nigrospora oryzae* (B. & Br.) Petch, parasitic on Maize.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 233–240, 5 figs., 1931.

A brief account is given of experiments which established that the serious rot of the rachids of maize by *Nigrospora oryzae* in Rumania [*R.A.M.*, x, p. 725] is primarily due to the activity of the moth *Sitotroga cerealella*, the female of which deposits her eggs inside the maize grains, and in so doing infects the cobs with spores of the fungus adhering to her body. Only fresh cobs, rich in water, are susceptible to infection, as the fungus fails to establish itself in the absence of sufficient humidity. Indirect evidence of the responsibility of the moth in carrying the disease is the fact that the variety *vulgata* of maize, the grains of which are so closely packed together in the cob that the moth cannot penetrate between them, is immune from infection. The fungus was shown not to affect the germinability of the seed-grain, as it was never found to be present in the embryo or in the endosperm, but there was positive evidence that the disease is perpetuated in the field by spores of the fungus carried by the seed, the more so since the spores are very resistant to desiccation and heat. The fungus is also capable of living in the soil saprophytically. The work indicated further that infection may occur on the standing maize, when the cobs are opened by birds and thus exposed to visitation by the moth, and also on cobs that are left on the fields in small heaps after harvest, and in storage, when the cobs are put away insufficiently dry.

WILSON (J. J.) & REDDY (C. S.). **Further studies on the fungicidal efficiency of chemical dusts containing furfural derivatives.** —*Phytopath.*, xxi, 12, pp. 1099–1113, 1931.

Among 58 different concentrations of the organic mercury compounds containing a furan ring, a concentration of 5 parts of G 1 (the precipitate formed when solutions of mercuric chloride and furfuramide are stirred together) and 95 parts of talc consistently

gave the best control of certain fungi pathogenic to maize, e.g., *Diplodia zeae*, *Basisporium gallarum* [*Nigrospora sphaerica*], and *Gibberella saubinetii*, without injurious effects on nearly disease-free seed-grain [*R.A.M.*, ix, p. 521]. When the best furan dusts and three commercial dusts were ranked in order of efficiency on the basis of acre-yield increases in each of three large field experiments [the results of which are discussed and tabulated] in 1928, it was found that treatments with compounds containing the furan ring occurred twice in the four highest in one test, four times out of four in another, and three times out of four in the remaining trial.

HOLBERT (J. R.) & KOEHLER (B.). **Results of seed-treatment experiments with yellow Dent Corn.**—*U.S. Dept. of Agric. Tech. Bull.* 260, 63 pp., 2 col. pl., 11 figs., 2 diags., 6 graphs, 1931.

A comprehensive survey, accompanied by 43 tables, is given of 11 years' experiments at the Illinois Agricultural Experiment Station and elsewhere in the United States on the control of various seed-borne diseases of maize by seed treatment, progress reports on which have been noticed from time to time in this *Review* [see preceding abstract]. Organic mercury dusts have now completely replaced the liquid fungicides in the treatment of *Diplodia zeae*, *Gibberella saubinetii*, and the other fungi occurring on maize seed, and their use is generally followed by an increased yield of some 3 bushels per acre in the case of average farmer's seed, as well as by better early vegetative growth.

STOUGHTON (R. H.). **The influence of environmental conditions on the development of the angular leaf-spot disease of Cotton. III. The influence of air temperature on infection.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 523–534, 1 pl., 3 graphs, 1931.

In continuation of his study on the development of the angular leaf spot disease of cotton (*Bacterium malvacearum*) under controlled conditions [*R.A.M.*, ix, p. 523; x, p. 26] the author describes the results of experiments which showed that high air temperatures favour the development of infection resulting from the spraying of young cotton plants (Sakellarides variety from the Gezira Plain) with a suspension of a virulent culture of *Bact. malvacearum*, the maximum infection occurring at 35° to 36° C., with decreasing incidence at progressively lower temperatures. At a constant air temperature of 39° to 40° the cotton plants did not grow and were eventually killed. The disease developed much more severely on leaves sprayed in the dark than on those that were inoculated in the light; it is believed that an explanation of this unexpected result may be found in the water relations of the host.

WILLIAMS (O. B.) & GLASS (H. B.). **Agglutination studies on Phytomonas malvaceara.**—*Phytopath.*, xxi, 12, pp. 1181–1184, 1931.

The results [which are discussed and tabulated] of agglutination experiments with 14 strains of *Phytomonas malvaceara* [*Bacterium*

malvacearum] isolated from field cotton in Texas showed that a high-titred agglutinating serum can be produced for this organism [*R.A.M.*, xi, p. 176]. Cross reactions with heterologous strains of the same organism revealed considerable differences in agglutinating titre, but no fundamental serological variations between the strains used could be established by absorption tests.

EZEKIEL (W. N.) & TAUBENHAUS (J. J.). **A disease of young Cotton plants caused by Sclerotium rolfsii.**—*Phytopath.*, xxi, 12, pp. 1191–1194, 1 fig., 1931.

Cotton seedlings growing in fine sandy loam soil at College Station, Texas, were attacked in July, 1929, by *Sclerotium rolfsii* [*R.A.M.*, vii, p. 541 ; x, p. 102] which girdled the stem bases and caused the rapid wilting and death of the plants. The infected areas first developed a water-soaked appearance and then became constricted near soil level; sometimes the cortex split along the diseased portions. The fungus passed from plant to plant on or through the soil, producing the typical mycelium and sclerotia. Inoculation experiments with *S. rolfsii* from cotton and carrots [see below, p. 349] gave positive results on cotton seedlings, but tests with the same organism from carrot and guar (*Cyamopsis tetragonoloba*) on other plants were unsuccessful, and the fungus is thought to attack mature plants only rarely. Fewer plants were infected by *S. rolfsii* on plots treated with the organic mercury compounds, K-I-X, PMA, semesan, No. 664, and Bayer dust against *Phymatotrichum omnivorum*, than on control plots.

TENG (S. C.). **A preliminary report on the studies of certain diseases of Cotton.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., vi, 10, pp. 117–134, 1931.

Cyrtosis or club leaf of cotton was originally named, described, and figured by O. F. Cook [*R.A.M.*, iv, p. 167], but S. C. Wang was the first to demonstrate the association of the leafhopper (*Chlorita biguttula*) with this disease (*Rept. for 1923–4, Cotton Res. Lab., Nat. South-eastern Univ.*, 28 pp., 1924. Chinese).

An experiment to ascertain whether cyrtosis would pass from one part of a cotton plant enclosed in a glass chimney, in which leafhoppers were placed, to another, gave negative results, no cyrtosis developing on any part outside the chimney. Attempts to produce the condition in insect-proof cages by various mechanical methods were also unsuccessful. Since feeding for short periods failed to produce cyrtosis, and since the severity of the disease increased more or less directly with the number of leafhoppers feeding on the plant, it seems possible that the disorder is due merely to direct injury by the insect. Bengal cotton (*Gossypium arboreum*) was shown by a test to be resistant to cyrtosis, while eight hairy varieties of Chinese cotton (*G. nanking*) were more or less susceptible. Hairiness alone, therefore, evidently does not confer resistance to cyrtosis, which is probably associated with some inherent chemical character in the Bengal variety.

All the 50 cotton varieties tested for their reaction to 'sore shin' (*Rhizoctonia*) [*Corticium solani*: ibid., x, p. 788], viz., one of *G. hirsutum*, two of *G. arboreum*, and 47 of *G. nanking*, proved

equally susceptible to the disease. Thirteen other species of plants belonging to eight families were also found to be susceptible. Moderately good control was given by scattering naphthalene along the rows at the rate of 30 lb. per acre at planting time, followed by another 30 lb. a week after germination, as well as by ceresan and Du Bay organic mercury dust No. 738 at the rate of 6 lb. per acre.

PETCH (T.). **Isaria arachnophila Ditmar.**—*The Naturalist, 1931*, pp. 247–249, 1931.

The results of the author's investigations have shown that there are two distinct fungi on spiders in England which, since the time of Wallroth, have been confused under the name *Isaria arachnophila*. One of them is a *Hymenostilbe* [*R.A.M.*, xi, p. 241] which should be known as *H. arachnophila* (Ditm.) Petch, while the other appears to be the only European species of *Gibbellula* on spiders and should be referred to *G. aranearum* (Schw.) Syd.

SWINGLE (H. S.). **Life history of the Pecan weevil.** [*ex* Entomology.]—*Forty-second Ann. Rept. Alabama Agric. Exper. Stat. for the fiscal year ending June 30, 1931*, p. 49 [? 1931].

Pecan weevil (*Curculio caryae*) larvae were found to be infected by two fungous parasites, viz., *Metarrhizium anisopliae* [*R.A.M.*, xi, p. 179] and *Sporotrichum* [*Beauveria*] *bassiana* [ibid., x, pp. 380, 455; xi, p. 180], both of which were sufficiently promising in preliminary inoculation tests to warrant further experiments with a view to the control of the weevil.

LEFEBVRE (C. L.). **Preliminary observations on two species of Beauveria attacking the Corn borer, Pyrausta nubilalis Hübner.**—*Phytopath.*, xxi, 12, pp. 1115–1128, 3 figs., 1 graph, 1931.

This is an expanded account of the writer's comparative observations on *Beauveria bassiana* and *B. globulifera*, parasites of the European corn borer (*Pyrausta nubilalis*) in the United States [*R.A.M.*, x, p. 380].

SARTORY (A.), SARTORY (R.), MEYER (J.), & CHARLES. **Un nouveau Mycoderma pathogène: Mycoderma nobile n. sp.** [A new pathogenic *Mycoderma*: *Mycoderma nobile* n. sp.—*Ann. Mycol.*, xxix, 5–6, pp. 325–338, 6 figs., 1931.

From a tumour following a wound on the arm of a female patient, the authors isolated on carrot and other standard media a fungus characterized by extensively branched, septate hyphae, up to 5 μ in diameter, with numerous ampullae and piriform swellings. A single hypha may be divided into as many as eight segments resembling silk-worm cocoons in shape and measuring 6 to 8 by 2 to 3 μ, some of which become detached, germinate, and give rise to a septate mycelium. Sometimes the main hyphae divides at the apex into quasi-rectangular segments (7·5 by 2·5 μ). In scrapings from the arm the organism appeared exclusively in the form of spherical or ovoid elements measuring 5 by 5 or 7 by 3·5 μ. The optimum temperature for the development of the fungus, which is

named *Mycoderma nobile* n. sp. [cf. *R.A.M.*, x, p. 105], is 25° to 32° C., but it is necessary to initiate the cultures at 37° to ensure growth. The optimum hydrogen-ion concentration is P_H 6·4 to 6·8, with a range from 5·2 to 6·5. Saccharose, glucose, starch, galactose, and mannose are assimilated.

BOLLEY (H. L.). **Flax production in Argentina.**—*North Dakota Agric. Exper. Stat. Bull.* 253, 82 pp., 79 figs., 4 graphs, 1 map, 1931.

The large-seeded Argentine flax varieties are stated to suffer little damage from rust [*Melampsora lini*], but the small-seeded varieties, e.g., N[orth] D[akota] R[esistant] 114, Linota, and other types of Russian origin suffer as severely from this disease in Argentina as in North Dakota [*R.A.M.*, x, p. 384]. Pasmo disease [*Phlyctaena linicola*: ibid., xi, p. 45] is extremely destructive at times, causing shrivelling and scabbing of the seed; during 1930–1 this fungus caused severe injury to the late planted flax crops in Entre Rios and north Santa Fé. In the early planted areas the disease affected only the lower stem or stubble portions, whence it subsequently spread to the later planted crops, killing the upper half of the straw, blossoms, and seed bolls. The Bison and Buda varieties showed some degree of resistance to *P. linicola*. Fusarial wilt [*Fusarium lini*: ibid., xi, p. 182] caused appreciable losses only in the semi-dry land zones.

CALINISAN (M. R.). **Attempts to re-establish Abacá plantations in Cavite, previously wiped out by bunchy-top.**—*Philipp. Journ. of Agric.*, ii, 3, pp. 209–221, 5 pl., 1 chart, 1931.

The results [which are discussed and tabulated] of experiments conducted since 1928 in Cavite, Philippine Islands, to determine the reaction to bunchy top of a number of introduced varieties of abacá [*Musa textilis*: *R.A.M.*, xi, p. 183] indicate that the prospects of re-establishing the devastated plantations with any of these varieties are by no means promising. On the other hand, evidence has been obtained of resistance to bunchy top in the local varieties, Sinibuyas and Kinalabao, the propagation of which is now being carried out on a large scale by the Bureau of Plant Industry. The application of commercial fertilizers failed to prevent the occurrence of bunchy top, but potassium sulphate, and to a lesser extent calcium superphosphate, delayed the early manifestations of the disease in greenhouse trials.

CALINISAN (M. R.), AGATI (J. A.), & ALDABA (V. C.). **Preliminary notes on the stem-rot of Abacá in the Philippines.**—*Philipp. Journ. of Agric.*, ii, 3, pp. 223–227, 3 pl., 1931.

During the early part of 1931, abacá [*Musa textilis*] plants at the Silang Experiment Station, Cavite, Philippine Islands, were affected by a hitherto unreported disease causing a rapid rotting of the leaf sheaths of the pseudo-stem which within a month or so bent over and consequently became useless for stripping. The first symptom of infection is the development of brown lesions, the size of a pin's head, on the outer sheaths. The very dark centres of the spots are surrounded by a paler area, the whole

being enclosed by a brown ring, giving a bull's eye effect. Five or more such spots usually develop close together and later coalesce to form a large, dark brown to black, oval-oblong lesion, depressed in the middle, where a cushion of greenish to brown mouldy growth is produced, and running parallel to the length of the pseudo-stem. Two or more of the lesions may develop on a single trunk, working through one leaf sheath after another towards the heart. When the fifth or sixth sheath is reached the pseudo-stem bends over from the weight of the foliage, which is usually green and healthy. The diseased sheaths shrivel, curl backwards, and droop, the breaking point mostly occurring at the chief area of girdling. Twelve varieties have been found affected by stem rot, the incidence of which is highest in Baluñganon and Balunan (46·86 and 43·77 per cent., respectively), and lowest in Sinibuyas and Kinalabao (8·92 and 4·39 per cent., respectively); the Pulian variety was also fairly resistant, with 14·43 per cent. infection. Observations in Davao in the middle of 1931 showed that the Tañgoñgon, Boñgolanon, and Maguindanao varieties also suffer from stem rot which occurred, however, in a milder form than in Cavite.

The causal fungus was isolated on steamed maize meal and grown on potato dextrose agar and oat agar. It is characterized by erect, brownish conidiophores and elongated to clavate conidia, up to 126 μ in length and with 3 to 12 or more septa. The typical stem rot symptoms developed in four to five days on six-month old, uninjured abacá plants inoculated with four- to five-day old cultures on potato dextrose agar, and also on field plants over $2\frac{1}{2}$ years old, the incubation period in the latter case being five to six days. The fungus (probably a species of *Helminthosporium*) was reisolated or recovered from each of these inoculations.

The losses from stem rot were minimized by cutting down and burning all severely diseased plants, and by early harvesting of the remainder.

PALM (B. T.). **A disease of Hibiscus sabdariffa caused by Rhodochytrium.**—*Phytopath.*, xxi, 12, pp. 1201–1202, 1931.

Attention is drawn to the occurrence on roselle (*Hibiscus sabdariffa* var. *altissima*) in 1926 on the east coast of Sumatra of the alga *Rhodochytrium spilanthidis*, causing a pronounced distortion of the top leaf blades, the lower sides of which were covered with small, bright red galls containing the resting spores and zoosporangia of the organism. Normal growth was eventually resumed above the infected region, but the affected plants remained stunted in comparison with normal ones. The sporangia of *R. spilanthidis* send haustorium-like prolongations into the fibro-vascular bundles of the host, so that the presence of the alga in a plant cultivated for its fibres is clearly detrimental. Care should be taken to keep the roselle fields free from weeds, two of which, viz., *Spilanthes acmella* and *Ageratum conyzoides*, apparently acted as sources of infection by *R. spilanthidis*.

PAPE (H.). **Zur Kräuselkrankheit der Poinsettie.** [On the curl disease of Poinsettia.]—*Gartenwelt*, xxxv, 52, p. 716, 1 fig., 1931.

Further observations on the curl disease of poinsettias

[*Euphorbia pulcherrima*] in the Kiel district (Germany) [*R.A.M.*, vii, p. 246] showed that the bracts, in addition to the lower leaves, are severely distorted. Moreover, these organs were of a greenish colour with only an occasional trace of the normal vivid scarlet. The diseased plants are useless for commercial purposes.

LAUBERT (R.). **Eigenartige Krankheitserscheinungen an Syringa vulgaris.** [Peculiar pathological symptoms on *Syringa vulgaris*.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), pp. 413–414, 1 pl. (facing p. 409), 1931.

A white lilac in the writer's garden in Berlin developed symptoms of silver leaf in May, 1931. The leaves of many of the current season's shoots were poorly developed, and the axillary buds grew prematurely into shoots with small leaves, giving an incipient witches' broom aspect to the whole twig. The floral buds were dead. On the older wood, which had been drastically pruned a few years earlier, many fruiting bodies of *Stereum purpureum* were observed.

JONES (L. R.) & RIKER (REGINA S.). **Wisconsin studies on Aster diseases and their control.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 111, 39 pp., 12 figs., 2 diags., 1931.

The cultivation of the China aster [*Callistephus chinensis*] in the United States is seriously menaced by two diseases, viz., yellows [*R.A.M.*, x, p. 734] and wilt (*Fusarium conglutinans* var. *callistephi*) [ibid., xi, p. 244]. In this bulletin the authors summarize the available information on these diseases, and discuss especially the results obtained with specific control measures. For six years yellows has been controlled in Wisconsin by the use of cloth-covered cages or houses to exclude the insect vector, *Cicadula sexnotata*, the tops and sides of the enclosures being completely covered with material not coarser than 22 × 22 threads per inch. The following strains of aster developed in Wisconsin are stated to combine resistance to wilt with suitable colours and habits of growth for commercial purposes: American Branching, Heart of France, Comet, Royal, and American Beauty [ibid., ix, p. 510]. The data obtained from extensive field trials by a commercial seed firm in California justify the hope that further trials on aster-sick soil will reveal the existence of numerous highly wilt-resistant strains among the standard varieties.

DRECHSLER (C.). **A crown rot of Hollyhocks caused by Phytophthora megasperma.**—*Journ. Washington Acad. Sci.*, xxi, 21, pp. 513–526, 5 figs., 1931.

Hollyhocks (*Althaea rosea*) in the District of Columbia were affected, in May and early June, 1931, by a disease which manifests itself through poor growth of new shoots, though these may reach 1½ to 2 m. high before any symptoms are seen. Ordinarily the shoots fall over, one after another, without warning and within a few days the entire growth from a well-developed crown may be killed. Examination of the underground parts shows that the short stem is usually completely involved in a decay which extends into the fleshy roots, sometimes to a depth of 20 cm., with

a complete softening of the internal tissues. Usually the decay only penetrates a very short distance into the new shoots, the line of demarcation between diseased and healthy tissues being sharply defined by a dark marginal zone.

The intercellular mycelium of a *Phytophthora* was found in most of the rotted tissues, and this, on isolation, readily formed sexual organs. The oogonia range from 16 to 61 μ in diameter (average 47·4 μ) and the oospores from 11 to 54 μ (average 41·4 μ). The antheridia measure 10 to 18 μ in breadth and 14 to 20 μ in length; they are predominantly paragynous on maize meal agar, but on Lima bean agar a larger proportion were amphigynous (up to 35 per cent.). The organism is clearly homothallic, the mycelial connexion between the antheridium and oogonium being readily traceable.

The non-papillate sporangia are generally ovoid but may, like the antheridium, frequently be furnished with a distal lobe; they measure 6 to 45 μ across and are 15 to 90 μ long. The hypha supporting the sporangium is proliferous, bearing a second or third sporangium on the same axis, and measures 2 to 2·5 μ in diameter. The zoospores, of which 1 to 45 are produced in a sporangium, are reniform, longitudinally grooved, biciliate, 10 to 13 μ in diameter, germinating by 1 to 3 germ-tubes and often giving rise to a secondary zoospore either directly through an evacuation tube or by the formation of an elongated miniature sporangium 6 to 10 μ in diameter and 16 to 22 μ in length on a germ sporangiophore.

In the dimensions of its sexual organs the hollyhock *Phytophthora* approximates closely to the fungus described by Mrs. Alcock in connexion with the Lanarkshire strawberry disease (*P.* (?) *cinnamomi*) [*R.A.M.*, ix, p. 795], while in asexual reproduction it resembles *P. cryptogea*, *P. cinnamomi*, and *P. cambivora*. The writer knows of no other *Phytophthora* combining the large dimensions of the hollyhock fungus with predominantly paragynous antheridia, proliferous, non-papillate sporangia, and the absence of large globose 'chlamydospores', and the organism under discussion is therefore named *P. megasperma* n. sp.

ROBERTSON (H. T.). **The fungus Plenodomus meliloti, causing a root rot of Hollyhocks.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, p. 23, 1931.

Plenodomus meliloti [*R.A.M.*, xi, p. 246] was isolated from the roots of hollyhocks (*Althaea rosea*) at Calgary in 1929 and was inoculated during the winter of 1929–30 into the roots of sweet clover [*Melilotus alba*] and hollyhocks with positive results. It is concluded that the fungus is pathogenic to hollyhocks under winter conditions in Canada.

TOCHINAI (Y.) & SHIMADA (S.). **Further note on Narcissus bulb-rot.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 1, pp. 23–26, 6 figs., 1931.

As a result of further investigations and consultation with Prof. J. Westerdijk, the writers have decided to re-name *Sporotrichum narcissi* and *S. radicicolum*, parasitic on *Narcissus pseudonarcissus* bulbs in Tokyo [*R.A.M.*, x, p. 246], *Trichoderma*

narcissi Tochinai et Shimada, nom. nov. and *Pachybasium bulbicolum* Tochinai, sp. nov., respectively. Amended technical descriptions of both organisms are given in Latin and English.

P. bulbicolum, a weak parasite on *Narcissus* bulbs and *Crocus* corms in association with *T. narcissi*, may be recognized by its pale yellowish-green or buff-coloured hyphae; erect, hyaline, branched conidiophores, 4·5 to 5·2 μ wide, bearing laterally or terminally piriform sterigmata, measuring 4·5 to 9·5 by 3·3 to 5 μ, mostly 5·5 by 3·5 μ, the short branches of the conidiophores and sterigmata being sometimes verticillate; and oval or ellipsoid, pale yellowish-green or subhyaline conidia, 2·5 to 4·5 by 1·8 to 3 μ, produced on the attenuated ends of the sterigmata.

Dorph-Petersen (K.). **Beretning fra Statsfrøkontrollen for det 60. Arbejdsaar fra 1 Juli 1930 til 30 Juni 1931.** [Report of the State Seed Testing Service for the 60th year of activity from 1st July, 1930, to 30th June, 1931.]—*Tidsskr. for Planteavl*, xxxvii, 5, pp. 799–871, 1931.

Section ix of this report (pp. 845–848) contains the following items of phytopathological interest [cf. *R.A.M.*, ix, p. 387]. Sclerotia of *Claviceps purpurea* were found in 17 out of 176 samples of timothy [*Phleum pratense*] seed, 4 out of 268 of rye grass [*Lolium perenne*], 2 out of 124 meadow fescue [*Festuca pratensis*], 1 out of 95 field brome [*Bromus arvensis*], 25 out of 82 oat grass [*Avena elatior*], 12 out of 150 cock's-foot grass [*Dactylis glomerata*], 1 out of 32 meadow foxtail [*Alopecurus pratensis*], 17 out of 63 meadow grass [*Poa pratensis*], 16 out of 59 rough-stalked meadow grass [*P. trivialis*], 17 out of 15 soft grass [*Holcus lanatus*], and 4 out of 9 dog's-tail grass [*Cynosurus cristatus*]. They were further found in various samples of clover seed.

Sclerotia of *Sclerotinia trifoliorum* were detected in 29 out of 486 samples of red clover seed, once in samples of white and crimson clover, and twice in snail's medick [*Medicago scutellata*]. *Typhula trifolii* occurred in 10 out of 860 samples of various clovers.

Ustilago perennans was found in 16 out of 82 samples of *Avena elatior*, and *U. bromivora* in 45 out of 95 *B. arvensis*. All the 18 samples of *H. lanatus* contained *Tilletia holci* spores.

Erwinia [*Phytomonas*] *rathayi* [ibid., iii, p. 18] occurred in 66 out of 150 samples of *D. glomerata*.

Nassonoff (O. I.). **Попереднє повідомлення про спостереження над переноспоріозом Люцерни.** [Preliminary account of observations on the downy mildew of Lucerne.]—*Наукові Записки з Цукрової Промисловости* (*Works Scient. Res. Inst. of Sugar Industry*), Kieff, xiv, 2–3, pp. 519–525, 2 graphs, 1931.

The author states that downy mildew of lucerne (*Peronospora aestivalis*) [considered by Gäumann to be the correct name for *P. trifoliorum*: *R.A.M.*, x, pp. 316, 436, 439] was very prevalent in 1931 in the Ukraine, especially on the crops of the second year of growth; the first cutting of the season was severely damaged, owing to the exceptionally high rainfall during the spring. Observations on the relative resistance to the disease of some 90

varieties of lucerne of various origin showed that the Bulgarian variety Elite of Sofia suffered least, followed by two varieties from Asia Minor; the varieties originating from Russia were also resistant, while all the American, French, Italian, English, and Asiatic varieties were heavily infected. It was also noted that low-yielding varieties appear to be more susceptible to the mildew than the more productive.

NICOLAS (G.) & AGGÉRY (Mlle). **Nouvelles observations sur les maladies bactériennes des végétaux.** [New observations on bacterial diseases of plants.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 195–203, 3 figs., 1931.

In continuation of their studies [*R.A.M.*, x, p. 462], the authors give a brief account of generalized bacterial infections observed by them on a young loquat (*Eriobotrya japonica*) tree in the grounds of the Botanical Laboratory in Toulouse, and on a number of lilac bushes in the neighbourhood of that town.

The loquat tree showed the first symptoms in 1926, which were then ascribed to a microlepidopteron (*Laspeyresia* sp.). In the spring of 1931 it put out abnormal shoots bearing deformed, yellowish leaves, which soon dropped whilst the flower buds dried up. The trunk of the tree was denuded of its bark, and bore a few cankers exuding a black, mucous liquid; a number of the twigs were dead. All the aerial organs (the roots were not examined) of the tree were found to contain large numbers of a bacterium which on agar produced small, circular, faintly pink colonies. The organism is a Gram-negative rod measuring 1·5 to 6 by 0·5 to 0·7 μ, disposed in chains simulating filaments, and slowly liquefying gelatine. It closely agrees in all its characters with *Bacillus amylovorus* [ibid., x, p. 529], with which it is provisionally identified, this being stated to be the first record of this organism in France. The pathogenicity of this bacterium was not tested.

The disease of the lilac bushes, which was observed in 1930 and 1931, is characterized by symptoms varying from a slight deformation, accompanied by brown spots, to an almost complete abortion of the leaves, which are reduced to a thread-like formation; and by a desiccation of the twigs. All the tissues of the infected organs were shown to be invaded by two forms of *Coccus*, one of which produced circular, pure white, and the other circular, yellowish-white colonies on agar. It is believed, however, that other organisms may be implicated.

PIERSTORFF (A. L.). **Studies on the fire-blight organism, Bacillus amylovorus.**—*Cornell Agric. Exper. Stat. Memoir* 136, 53 pp., 3 pl., 1931.

This is an account of the author's studies, during the years 1923 to 1926, of the fire blight (*Bacillus amylovorus*) problem in the United States. The natural occurrence of the disease is recorded on hawthorn (*Crataegus oxyacantha*) [*R.A.M.*, x, p. 319] and the rose variety Tausendschön, while inoculations were also successful on sweetbrier (*Rosa eglanteria*), some other varieties of the

cultivated rose, strawberry flowers and young green fruits, Japanese quince (*Chaenomeles lagenaria*), and *Photinia villosa*.

Cultural studies of *B. amylovorus* indicated that it can live in acid media of P_H 4·6, that it can withstand a temperature of −183° C. for ten minutes, and that heating to 48° C. does not always inhibit its growth; sucrase (or invertase), maltase, inulase, and arbutase were produced by the organism, but not amylase, pectosinase, pectase, pectinase, cellulase, amygdalase, or trypsin. A toxic substance was found to be formed in green pear fruits rotted by *B. amylovorus*, which, while possessing many of the characters of a true bacterial toxin was not thermolabile nor was it inactivated when exposed to the air.

Field observations and laboratory experiments showed that the commonest mode of entrance of the organism into blossoms is through the nectariferous surfaces, but entry may also occur occasionally through the petals and styles [ibid., ix, p. 189]. Naturally infected leaves were found on pear trees infested with leafhoppers in the field, but attempts to inoculate young, rapidly growing apple and pear trees with *B. amylovorus* in the absence of the insects gave negative results [cf. loc. cit.]. For the first 24 hours from inoculation the organism progressed slowly in young apple shoots [ibid., viii, p. 250], after which, however, and for a period of eight days, it advanced at the rate of nearly 1 inch a day. Atmospheric water did not appear to spread infection from blossom to blossom. The susceptibility of the blossoms to infection decreased with their age, but pollination had little, if any, influence on their susceptibility. Viable cultures of *B. amylovorus* were isolated from hold-over cankers on twigs as small as one-fourth inch in diameter, and also from infected branches that had been kept for two years in the laboratory.

Nisikado (Y.). **Beiträge zur physiologischen Spezialisierung einiger obstbewohnender Fusarien.** [Studies on the physiological specialization of some fruit-inhabiting *Fusaria*.]—*Ber. Ohara Inst. für Landw. Forsch.*, v, 1, pp. 107–144, 4 pl., 4 graphs, 1931.

A full account is given of the writer's comparative investigations on a number of strains of *Fusarium lateritium* Nees [*Gibberella moricola*: *R.A.M.*, viii, pp. 143, 153; xi, p. 95] and *F. oxysporum* carried out at the Biologische Reichsanstalt, Dahlem, with the object of ascertaining whether physiological-pathological races occur in these species. For this purpose the author studied six strains of *F. lateritium*, one of *F. lateritium* form 1 Wr. [see below, p. 339], five of *F. lateritium* var. *fructigenum* [formerly known as *F. fructigenum*: ibid., xi, p. 52], three of *F. oxysporum*, and two of *F. oxysporum* var. *aurantiacum*.

On such standard media as sterilized potato disks or barley ears nearly all the strains of *F. oxysporum* showed the mycelial type of growth, whereas *F. lateritium* form 1 Wr. and a citrus strain of *F. lateritium* always formed pionnotes; the remaining strains of *F. lateritium* and those of *F. lateritium* var. *fructigenum* showed partly the mycelial and partly the pionnotes or sporodochial type of development.

The minimum, optimum, and maximum temperatures for the growth of all the strains of *F. oxysporum* used in the tests were 7° to 8°, 27·5° to 29°, and 35° to 37° C., respectively. The Dutch raspberry cane strain of *F. lateritium* grew well at a low temperature, its optimum being about 23°. All the four strains of *F. lateritium* from citrus in southern Europe throve at higher temperatures than the last-named (optima 23° to 25°). *F. lateritium* form 1 Wr. and *F. lateritium* var. *fructigenum* grew best at 26°.

Not only oranges and citrons, but also apples were rotted by *F. lateritium* isolated from citrus in the southern European countries, as well as by the Dutch raspberry cane strain of this fungus. *F. lateritium* var. *fructigenum* (mycelial type) from Spanish oranges caused little injury to oranges but proved highly pathogenic to apples, whereas the reverse was the case with a strain of the same organism from a Portuguese tangerine (pionnotes type).

On the whole, the writer's conclusions regarding the pathogenicity of the different types of *F. lateritium* var. *fructigenum* (mycelial, sporodochial, pionnotes, and long-spored) agree with those reached by Brown and his collaborators [ibid., vii, p. 475]. In the case of *F. lateritium*, however, pathogenicity appeared to be independent of the condition of the fungus, an Italian sporodochial type from citrus being equally virulent as the mycelial types from Spanish oranges and from Dutch raspberry.

Benlloch (M.). **El moho de las frutas.** [Fruit mould.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 134–136, 2 figs., 1931.

Brief, popular notes are given on the 'mould' of apples and pears caused in Spain by *Sclerotinia fructigena*. *S. cinerea* attacks plums, cherries, and peaches in a similar manner, and *S. laxa* [*S. cinerea*: *R.A.M.*, vi, p. 619] is occasionally found on apricots. Recommendations are made for the control of these rots.

Nicholls (H. M.). **The life history of the black spot fungus.**—*Tasmanian Journ. of Agric.*, N.S., ii, 4, pp. 186–193, 4 figs., 1 diag., 1931.

This is a semi-popular account of the life-history of the black spot fungi of apple (*Venturia inaequalis*) and pear (*V. pirina*) in Tasmania, followed by a brief discussion of its bearing on the measures for the control of the diseases [cf. *R.A.M.*, xi, p. 112].

Johnstone (K. H.). **Observations on the varietal resistance of the Apple to scab (Venturia inaequalis, Aderh.) with special reference to its physiological aspects.**—*Journ. Pomol. and Hort. Science*, ix, 3, pp. 195–227, 2 figs., 2 diags., 5 graphs, 1931.

In further investigations conducted by the author at Long Ashton into varietal resistance of apple trees to scab (*Venturia inaequalis*) [*R.A.M.*, xi, p. 48] a study was made of the toxicity to the fungus of liquids expressed from apple leaves, fruits, and twigs.

Within a wide range of variation, the leaves of resistant apple varieties yielded a liquid more toxic to the spores of *V. inaequalis*

than did the leaves of susceptible varieties. A more toxic liquid was obtained from young leaves than that obtained from old ones, and from leaves gathered in the afternoon than those gathered in the morning; highly toxic liquids were obtained from trees suffering from nitrogen deficiency. The liquids expressed from fruits varied in toxicity, those from young fruits being highly toxic.

Inoculation experiments on trees growing under various nutritional conditions showed that the period of incubation was longer in Bramley's Seedling than in Worcester Pearmain but apparently bore no relation to the nutrition of the tree. A lower proportion of infections occurred in trees of both varieties which were deficient in nitrogen or received rain water only. Individual lesions persisted longer on Worcester Pearmain than on Bramley's Seedling; persistence was remarkably short in trees deficient in nitrogen, much longer in trees deficient in potash, and somewhat longer in trees deficient in calcium and magnesium.

A toxin, possibly astringent, was removed from leaf and fruit extracts both by the addition of gelatine to the liquid and by filtration; tannic acid was remarkably toxic to the conidia of *V. inaequalis*. After being kept for some hours the expressed liquid, as a result of enzyme action, underwent a reduction in toxicity; liquids in which the enzymes were destroyed by heat or removed by alcohol showed, in general, greater toxicity than fresh extracts. No relation was established between the toxicity of the expressed liquid and its P_H value.

The general conclusion drawn from this and the author's previous work [loc. cit.] on the subject is that the ultimate character distinguishing a resistant from a susceptible variety is associated with the nature of the fluids bathing the epidermal cell walls. In a susceptible variety the fungus is able to establish itself beneath the cuticle, as a congenial environment is encountered; in a resistant variety the environment is uncongenial. The author's earlier study does not suggest that any factors associated with spore germination and penetration are in themselves adequate to distinguish resistant from susceptible varieties. Differences in the frequency with which scab is observed on certain varieties are, however, dependent on morphological host characters, protective hairs, for example, by their elimination of germinating spores, reducing the liability of an organ to become infected. In the cuticle, morphological characters changing with increasing age result in differences in the length of the period of susceptibility of some susceptible and resistant varieties. True resistance appears to depend on the physiological relations between host and parasite within the leaf. Failure of the fungus to grow beneath the cuticle is due rather to the toxicity of the sap than to the absence of suitable nourishment, though in nitrogen-deficient trees starvation phenomena may be involved.

Hockey (J. F.), Woolliams (G. E.), & Berkeley (G. H.). **Seasonal development of the Apple scab fungus.**—*Rept. Dominion Botanist for the year 1930, Div. of Botany, Canada Dept. of Agric.*, pp. 103–105, 1931.

During 1930, the first spore discharge of *Venturia inaequalis*

[*R.A.M.*, x, pp. 82, 776] in Nova Scotia was recorded in two localities on 16th May. Though the heaviest ascospore discharge is usually anticipated just before full bloom, the period under review was exceptional in that while a heavy, prolonged ascospore discharge occurred as the bloom was beginning to open, i.e., 27th May to 2nd June, a further heavy ascospore infection period followed from 19th to 21st June. The final ejection of ascospores was recorded at Kentville on 25th June.

In New Brunswick the first ascospore discharge took place on 16th and 17th May, on which dates a total rainfall of 0·47 in. was recorded. A second period of ascospore discharge of greater intensity than the first occurred on 20th to 22nd May, and there were two additional ascospore ejections between 26th and 31st May and between 9th and 16th June. The last period showed two peaks of spore intensity on 10th and 16th June, the latter date being that of the final discharge recorded.

The first spore discharge in the Okanagan Valley, British Columbia took place at the end of April or early in May, when the trees were in the pre-pink or pink stage.

In Ontario the perithecia of *V. inaequalis* were practically mature by 5th April but dry conditions during that month delayed the initial ascospore discharge until 1st May.

RUEHLE (G. D.). **New Apple-rot fungi from Washington.**— *Phytopath.*, xxi, 12, pp. 1141–1152, 4 figs., 1931.

A list is given of 39 species of fungi isolated from stored apples in Washington from 1926 to 1929, including the following new species, technical diagnoses of which are given in English [*R.A.M.*, x, pp. 226, 674].

Cephalosporium carpogenum n. sp., a relatively infrequent weak parasite, was obtained from dark brown areas bordering worm holes or punctures. The inoculation of Jonathans at 20° C. resulted in the development in 30 days of small spots, a few of which by the end of two months had reached a diameter of 20 mm.

The conidiophores are hyaline, tapering, simple, non-septate, 1·5 to 2 μ wide at the base, and 25 to 45 μ long. The conidia are hyaline, continuous, ellipsoidal to short cylindrical, 4 to 8·5 by 1·4 to 2·8 μ, and forming small, globose heads 8 to 15 μ in diameter. The new species of *Cephalosporium* differs from *C. malorum* on stored apples in England [ibid., iv, p. 174] in its slower growth rate in culture and larger conidia (4 by 2 μ in the latter species).

Sporotrichum carpogenum n. sp., isolated from a dark brown lesion on a Jonathan apple, also grows very slowly in culture (20 mm. in 10 days), forming a greyish-olive mat with radiate furrows. The conidiophores generally measure 6 to 10 μ in length, occasionally up to 30 μ, and are swollen at the centre and tip. The subglobose to elliptical, hyaline, continuous conidia measure 2·8 to 6·4 by 1·8 to 3·5 μ and accumulate in loose clumps round the apex of the conidiophore. On inoculation into ripe Jonathans the fungus produced decay at 20° and at cold storage temperatures.

Botrytis mali n. sp. affects ripe apples similarly to *B. cinerea*, except in the absence of lenticel spotting [ibid., v, p. 746] and in the slightly slower growth of *B. mali* at all temperatures. The

erect, septate conidiophores, shorter and more branched than in *B. cinerea*, end in globose, swollen structures bearing conidia on small sterigmata about half the length of the spores. The continuous, hyaline, smoky grey conidia are ovate to ellipsoidal, usually finely apiculate at the base, and form dense heads; they measure 10 to 18 by 6·8 to 10·5 μ (average 11 to 14 by 7 to 9 μ); the black sclerotia, oval on top and flattened at the base, are usually 1 to 2 mm. in width but range from mere specks to 3 mm.

On 2 per cent. dextrose-potato agar and Czapek's solution agar *Cladosporium malorum* n. sp. [ibid., x, p. 193, 675] forms dense Roman green (Ridgway) colonies, reaching a diameter of 60 to 65 mm. in 10 days at 25°. The simple, septate, pale olive, short conidiophores produce long, branched chains of pale olive, oblong-cylindrical, smooth-walled, continuous or uni-septate conidia measuring 10 to 21 by 3 to 5 μ (average 14·7 by 3·6 μ). Apples inoculated with *C. malorum* develop dark brown lesions, the affected deeper tissues being light brown, somewhat dry, and spongy.

Mature perithecia, agreeing in the main with those originally described by Janczewski (*Bull. Internat. Acad. Sci. Cracovie*, xxvii, p. 187, 1894) as *Mycosphaerella tulasnei* [ibid., x, p. 194], developed sparsely in cultures of *C. herbarum* on maize meal and potato-dextrose agar held at low temperatures for long periods, and more abundantly on sterilized wheat leaves incubated at 8° to 10° for six months. The perithecia are black, thick-walled, broadly flask-shaped with a short neck, partially embedded in the leaf tissue and measured 150 to 250 by 100 to 150 μ. The asci are cylindrical, slightly tapering at the ends, 80 to 120 by 15 to 20 μ, while the hyaline, bicellular ascospores measure 18 to 28 by 6 to 8·5 μ.

SOLKINA (Mme A.). **Сумчатая стадия Sclerotinia fructigena Schröt. в окрестностях Ленинграда.** [The ascogenous stage of *Sclerotinia fructigena* Schröt. in the vicinity of Leningrad.] —*Plant Protection*, Leningrad, viii, 3, pp. 309–310, 1 fig., 1931.

In June, 1931, a mummied apple (Antonovka variety) was found in the neighbourhood of Leningrad, bearing four immature apothecia, which, when put in a moist chamber, in 23 days developed to full maturity. The apothecial cups were dark greyish-brown and from 0·6 to 1 cm. in diameter. The asci were cylindrical, 112 to 150 by 9 to 12 μ in diameter. The paraphyses were hyaline, and measured 130 to 180 by 3 to 4 μ. The ascospores were ovoid-elliptical, tapering at one or both ends, occasionally almost acuminate at the tips, continuous, hyaline, and 9 to 12 by 5 to 6 μ. These measurements agree with Schröter's descriptions of *Sclerotinia fructigena*, the ascigerous stage of which has been recorded again by Aderhold and Ruhland and with which the fungus found by the author is identified.

WILSON (E. E.). **A comparison of Pseudomonas prunicola with a canker-producing bacterium of stone-fruit trees in California.**—*Phytopath.*, xxi, 12, pp. 1153–1161, 1 fig., 1 graph, 1931.

A comparative study [the results of which are fully discussed

and tabulated] show that *Pseudomonas prunicola* Wormald [*R.A.M.*, xi, p. 160] very closely resembles an organism, herein designated 357, producing gummosis of plum and apricot trees in California. The latter organism differs in certain cultural details from *P. cerasi*, the reputed cause of cherry gummosis in Oregon, e.g., in the production of a yellow rather than a green discoloration in beef extract media and in its utilization of lactose and maltose. A second type of organism (506), which also causes gummosis of plums and apricots in California, is more closely allied to *P. cerasi* in respect of chromogenesis and may be identical with Goldsworthy's fluorescent type [ibid., vii, p. 563]. Both *P. prunicola* and 356 produced identical cankers and gumming on plum and cherry trees from which the organisms were re-isolated.

The writer considers that Wormald's new species, though its establishment was in all probability justified, should not be definitely accepted until the exact relationships between *P. cerasi* and the other agents of gummosis are elucidated.

DOWSON (W. J.). **The die-back disease of Apricots. Preliminary note.**—*Tasmanian Journ. of Agric.*, N.S., ii, 4, pp. 165–166, 1931.

The author states that of recent years a serious dying back of both young and old branches has appeared in Tasmania in comparatively young plantations of apricot, the cause of which has been traced to the growth into living wood of wound parasites from old pruning cuts, generally a stump where a shoot was not cut off level with the surface of the parent limb. Fruit bodies of *Nectria cinnabarina* have been frequently found associated with this trouble, and also on the heaps of prunings which are usually left lying at the edges of the orchards. The die-back can be best controlled by careful sanitation of the orchards, including the protection of pruning wounds with good white paint, and by measures directed towards promoting the health and vigour of the trees.

WORMALD (H.). **Further studies of the brown rot fungi. VI. Brown rot blossom wilt of the Morello Cherry: infection through unopened flowers.**—*Journ. Pomol. and Hort. Science*, ix, 3, pp. 232–237, 3 pl., 1931.

Morello cherries (varieties of *Prunus cerasus*) are very susceptible to attack by *Sclerotinia cinerea* forma *pruni*, which causes a blossom wilt and subsequently extends into the twigs, killing them back for several inches. Experimental evidence was obtained of the infection of unopened flowers by the fungus, and it was observed that two waves of infection may occur, one through the unopened flowers, the effect being noticed about the time when the trees come into full bloom, the other through the open flowers, when the resulting wilt of the twigs (above the infected node) occurs about a fortnight later. As the diseased twigs if left on the trees become sources of infection the following year, they should be promptly removed; spraying with Bordeaux mixture shortly before the flowers open is also advised. For these control measures to be

adequately effected Morello cherries should be grown as bush trees.

JØRGENSEN (C. A.). **Om Ribsbuskens Bladrandsyge.** [On leaf scorch of Currant bushes.]—*Tidsskr. for Planteavl*, xxxvii, 5, pp. 729–742, 8 figs., 1931.

Full details are given of the writer's three years' experiments in Denmark on the influence of various combined fertilizers on the development of leaf scorch in currants (Parker's Red variety) [*R.A.M.*, x, p. 738]. No definite conclusions can yet be drawn from these trials, but it would appear that a contributory cause of the condition is a failure to maintain the necessary balance between available potash on the one hand and nitrogen (and to some extent phosphoric acid) on the other [cf. ibid., x, p. 802]. Any excess of the latter constituents is inadvisable.

SĂVULESCU (T.) & SANDU (C.). **Micromycetes novi.** [New micromycetes.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 253–256, 3 figs., 1931.

In this paper Latin diagnoses are given of five species or varieties of parasitic fungi which are considered to be new to science, including *Gloeosporium ribis* var. *macrosporum* nov. var., which differs from the type species in its amphigenous acervuli and in its larger conidia measuring 13·2 to 26·4 by 5·7 to 7·5 μ (majority 16·5 to 20 by 6·6 μ) instead of 10 by 5 to 6 μ. This fungus was found on living gooseberry leaves in Rumania.

SKUTCH (A. F.). **The anatomy of the rhizome of the Banana in relation to infection by Panama disease.**—*United Fruit Co., Res. Dept. Bull.* 36, 7 pp., 1931. [Abs. in *Hort. Abstracts, Imper. Bureau of Fruit Production*, i, 4, p. 121, 1931.]

A description is given of the banana rhizome, with details of the technique employed in tracing the course of the vascular bundles, through the tracheids of which the Panama disease organism (*Fusarium cubense*) is stated to be chiefly carried [*R.A.M.*, x, p. 393]. The unbroken surface of the rhizome apparently presents an effective barrier to the entry of the fungus. Natural breaks in the surface develop so gradually that the production of cork beneath them keeps pace with the ruptures. Possible points of entry are the scars left by the decay of the older leaf sheaths, infection taking place during the brief period of inadequate protection between the rotting of the sheath and the formation of resistant tissues [ibid., x, p. 739].

WARDLAW (C. W.). **Banana diseases. II. Notes on 'cigar-end' (Stachylidium theobromae Turc.).**—*Trop. Agriculture*, viii, 11, pp. 293–298, 3 pl., 1931.

In this, the second paper of this series [*R.A.M.*, xi, p. 190], the author gives a fuller account of the 'cigar-end' disease of the Canary banana [*Musa cavendishii*] caused by *Stachylidium theobromae*, a brief reference to which was made in a former communication [ibid., x, p. 806]. The disease is widespread in the

tropics; it is essentially a plantation disease, as the infection originates in the perianth and spreads slowly backwards causing a tip rot which frequently involves over one-third of the finger. In Trinidad, however, infections are usually restricted and the decay of the fruit does not extend beyond 2 cm. The internal symptoms differ from most other storage rots in that the flesh does not become soft and watery, but acquires a dry, fibrous appearance. The cortical tissues, on the other hand, are very thoroughly exploited by the fungus, so that the epidermis and vascular strands are characteristically distorted.

Although inoculation experiments with *S. theobromae* conducted in Trinidad during both the dry and the wet seasons consistently gave negative results, the author considers that circumstantial evidence leaves no doubt that the disease is caused by this fungus, the morphological and cultural characters of which are discussed in some detail.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **A Sclerotinia limb blight of Figs.**—*Phytopath.*, xxi, 12, pp. 1195–1197, 1 fig., 1931.

A brief account is given of a destructive limb blight of magnolia figs [*Ficus magnolioides*] occurring in 1926 in Galveston County, Texas, where this fruit is extensively grown for canning. A sudden wilting of the foliage was followed by the death of affected branches, the trunk also being attacked in some cases and the base occasionally girdled. A thick, white fungus growth covered the water soaked diseased areas, the exterior and interior of which soon developed numerous sclerotia resembling those of *Sclerotinia sclerotiorum* [*R.A.M.*, vii, p. 727], apothecia of which were found on partly buried sclerotia in the vicinity of infected trees. Inoculation experiments with an ascospore culture of the fungus gave positive results. *Tuberculariа fici* frequently overran the blighted limbs, especially the older ones, sometimes to the extent of obscuring the presence of *S. sclerotiorum*. The latter was observed in profusion on *Amaranthus reflexus*, a common orchard weed, and also on bean [*Phaseolus vulgaris*: ibid., x, p. 358] and lettuce [ibid., ix, p. 224].

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **An anthracnose of the Jujube.**—*Phytopath.*, xxi, 12, pp. 1185–1189, 2 figs., 1931.

A serious anthracnose disease of jujube (*Zizyphus jujuba*) fruit in Texas, resulting in heavy premature shedding, was found to be due, at any rate in part, to a species of *Gloeosporium* which appears to be closely related to, or identical with the apple bitter-rot organism (*Glomerella cingulata*), although the perfect stage failed to develop on the fruit or in culture. Healthy jujube fruits, apples, figs, grapes, Japanese persimmons [*Diospyros kaki*], peppers [*Capsicum annuum*], tomatoes, grapefruits, and oranges were successfully inoculated with spores from pure cultures originally isolated from the smooth or slightly sunken, circular, dark spots on jujube fruits, and the *Gloeosporium* was recovered from the infected tissues.

HORNE (W. T.) & PARKER (E. R.). **The Avocado sun-blotch disease.**—*Monthly Bull. Dept. of Agric. California*, xx, 7, pp. 447–454, 4 figs., 1931.

Further details are given concerning the sun blotch disease of avocado pear in California [*R.A.M.*, x, p. 474]. Only in severe cases do the twigs and limbs assume a decumbent habit owing to general weakness, while the foliage usually looks more or less normal. The most definite symptoms are observed on the youngest green stems of the Fuerte and similar varieties. Yellow streaks, which are often furrowed, extend for considerable distances on vigorous shoots. Sometimes several streaks unite and the whole stem turns yellowish-white, but more often the streak fades out towards the leaf base. Where the yellow colour is very vivid long cracks may form in the surface of young twigs. In the Caliente and Puebla varieties the streaks are less clearly marked, the yellow colour being diffusely mottled, so that identification is difficult. On older sun-blotched stems the bark becomes rough and thickened, while necrotic areas appear in the severely affected parts, especially on the side of the branch exposed to the sun. Probably these lesions are often mistaken for those due to ordinary sunburn. The bark of older limbs becomes very rough and in some cases shows abnormal streaking when sectioned.

Marked symptoms are exhibited by some of the fruits on diseased trees, consisting of longitudinal depressed streaks of varying width and colour—yellow in the Fuerte and nearly white to deep reddish-purple in other varieties. The streaks may extend the entire length of the fruit, starting at the stem, or they may be interrupted. On sectioning an infected Caliente fruit, areas of whiter, more opaque tissue are observed surrounding the fibres. Severely affected fruits are deformed and must be rejected in grading. The leaves are apparently normal in the Fuerte variety, but a peculiar yellowish-white variegation occurs in certain others. The Caliente and Puebla varieties may show pale blotches and much distortion of the foliage, while on Kashlar a remarkable white variegation, apparently due to sun blotch, has been observed.

The question of practical control of sun blotch by cultural measures is briefly considered.

SCHNICKER (J. L.). **Kviksølvbestemmelse i Afsvampningsmidler.** [Mercury determination in fungicides.]—*Tidsskr. for Planteavl*, xxxvii, 5, pp. 752–754, 1 diag., 1931.

The following method (devised by N. Lichtenberg, Copenhagen) has been found useful for the quantitative determination of the mercury content of tillantin C and other fungicides [cf. *R.A.M.*, x, p. 228]. A pyrex glass tube, 10 to 12 mm. in diameter, is filled with a layer of magnesium carbonate (25 mm. in height), a second layer of calcium oxide (a few millimetres), a third consisting of 3 gm. of the fungicide, 2 to 3 gm. cupric oxide, and 10 gm. calcium oxide, and a fourth of 3 to 5 cm. of calcium oxide, the whole being covered with asbestos wool. A tube is bent downwards at right angles and the mercury distilled off into a beaker and weighed. Certain modifications are necessary with ceresan owing to its

very low mercury content, and with the liquid dahmit [ibid., xi, p. 162].

Sproeien en sproeiers. [Sprays and spraying apparatus.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 33, 50 pp., 8 pl., 1931.

Popular notes are given on the control of a number of insect pests and fungous diseases of economic plants in Holland by the application of standard disinfectants. The paper further contains information on the various types of machinery in use, the cost of spraying, the correct method of execution, and other items of interest.

Bestrijding van plantenziekten in kleine tuinen. I en II. [Control of plant diseases in small gardens. I and II.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 19, 20 pp., 4 pl., 1931; 21, 22 pp., 5 pl., 1932.

Directions are given in popular terms for the control of plant diseases and pests in small gardens in Holland during (*a*) the winter, and (*b*) the growing period. The composition and application of some standard fungicides are described, with notes on the various well-known diseases against which they are effective.

Hecht (D.). **Über die Verwendung immunbiologischer Begriffe in der Phytopathologie.** [On the application of conceptions of biological immunity to phytopathology.]—*Biol. Zentralbl.*, li, 12, pp. 708–717, 1931.

This is a critical discussion of the current tendency to apply medical terminology in the phytopathological sphere, and of the consequent confusion, especially in the conceptions of active and passive immunity and kindred notions.

Loukyanovitch (F. K.), Lebedeva (Mme L. A.), Kizeritzky (V. A.), Ermolayeva (Mme O. I.), & Obolensky (S. I.). **Вредители и болезни сельско-хозяйственных растений в районе Туркестано-Сибирской железной дороги.** [Pests and diseases of agricultural crops in the region of the Turkestan-Siberian Railway.]—*Plant Protection*, Leningrad, vii, 4–6, pp. 349–360, 1931.

In this small collection of papers under the general title cited above the individual authors give notes on the chief insect pests and fungal diseases of agricultural crops observed by them in the course of a preliminary survey of the area traversed by the Turkestan-Siberian Railway. Rice—a relatively new introduction in that region, and the cultivation of which is ever extending in Russian Central Asia—suffers chiefly from attacks of *Helminthosporium oryzae* [*R.A.M.*, x, p. 759], which is stated to pass to it from barley. *Piricularia oryzae* [ibid., x, p. 337] is of rare occurrence so far, and measures should be taken to prevent its spread.

In Western Siberia, where soy-beans were tentatively introduced for the first time in 1930, all the varieties tested suffered fairly severely from a warty spotting stated to be caused by *Bacterium*

sojae [ibid., vi, p. 74]. In the region of Tashkent, a large proportion of the seedlings was killed by a *Fusarium* blight [ibid., xi, p. 88], the infection evidently being carried by the seeds which were obtained from the Russian Far East. The diseased beans are easily recognizable macroscopically, and in cases where the seed was sorted by hand before sowing the mortality of the seedlings was reduced from over 80 per cent. to almost nil. Other diseases of soy-beans which deserve serious consideration in that region are *Peronospora manshurica*, *Sclerotinia libertiana* [*S. sclerotiorum*], and a species of *Ascochyta* which attacks the pods [ibid., xi, pp. 87, 88].

Cotton in Russian Central Asia is attacked chiefly by *Fusarium vasinfectum* and bacteriosis (*Bact. malvacearum* and some other forms) [ibid., ix, p. 378]. In spite of their neglected condition, fruit trees suffer little from fungal diseases, some slight injury, however, being caused to young apple trees by powdery mildew (*Podosphaera leucotricha*). Fruit rot (*Monilia* [*Sclerotinia*] *fructigena*) only occurs in storage. Vines are frequently attacked by a species of *Fusarium* which causes debilitation and sterility of the stocks; the infection is propagated by cuttings from the diseased plants. Crown gall (*Bact. tumefaciens*) is also of fairly frequent occurrence on this host.

Stevens (F. L.) & Celino (M. S.). **Two diseases caused by Diplodia.**—*Philipp. Agric.*, xx, 6, pp. 370–373, 2 figs., 1931.

Tan-coloured spots up to 9 cm. or more long by 1 cm. or more wide, bordered by a brown band 1 mm. in width, which in turn is surrounded by a yellow area 1 mm. wide, are frequently observed on maize near Los Baños, Philippine Islands. The pycnidia occurring in the subepidermal tissues of the spots are dark brown and measure 180 to 260 μ in diameter; the ostiole protruding through the epidermis of either leaf surface is bordered by a narrow black ring. The dark brown, elongated, uni- or rarely biseptate spores, obtuse at each end, measure 45 to 80 by 9 μ, the septum usually being median but sometimes nearer one end of the spore. Except for the pycnidia, this disease bears a marked resemblance to the leaf blight caused by *Helminthosporium* [*turcicum*]. The fungus responsible for the tan spotting is a species of *Diplodia* considered to be identical with *D. macrospora* [*R.A.M.*, x, p. 238] notwithstanding certain slight differences, e.g., in spore length (given as 70 to 80 μ by Earle).

Luffa acutangula and *L. cylindrica* are affected by a soft, watery rot of the pericarp which progresses very rapidly through the host tissue, advancing as much as 5 cm. in 24 hours. The young pycnidia of the causal organism contain oval, unicellular, hyaline, large spores of the *Macrophoma* type, later turning dark but remaining continuous as in *Sphaeropsis*; at a more advanced stage they become uniseptate so that the fungus can finally be placed in the genus *Diplodia*. It is named *D. adelinensis* Stevens and Celino, n. sp. The pycnidia are densely black at maturity and measure 150 to 200 μ in diameter, ostiole 30 μ across, reticulations about 11 μ across. The ovoid, irregular, or inequilateral, black, uniseptate spores measure 18 to 24 by 14 μ and have a very

minutely echinulate surface. The fungus was isolated in pure culture from *L. acutangula* and produced on various agar media an abundant, hyaline, septate mycelium, inoculations with which on wounded *L. cylindrica* fruits gave positive results, the causal organism being reisolated and its pathogenicity conclusively proved by reinoculation.

BURGEFF (H.). **Organisation und Entwicklung tropischer Orchideen-Saprophyten. (Vorläufige Mitteilung.)** [Organization and development of tropical Orchid saprophytes. (Preliminary note.)]—*Ber. Deutsch. Bot. Gesellsch.*, xlix (*Generalversammlungsheft* 1), pp. 46–48, 1931.

A brief summary is given of the author's studies on the development of saprophytism in plants, carried out on material belonging to seven natural orders (including the Orchidaceae) collected by him in Java and the Philippines during 1927–8. The genera are arranged in three systematic groups showing the transition to extreme mycotrophy. The extent of saprophytic development was found to be physiologically determined by the quanity and quality of mycotrophic nutriment, i.e., in the last resort by the quality of the fungus symbiont. The *Rhizoctonia* fungi of the epiphytic and of the majority of terrestrial seedling mycotrophic-autotrophic species (semi-independent hosts) are the least efficient, being defective in the capacity for cellulose disorganization. The symbionts of the holosaprophytes are Hymenomycetes (with the mycelium showing clamp-connexions) which disintegrate the cellulose of raw humus. A case of extreme efficiency is furnished by the wood-destroying fungi, e.g., the symbiont of the holosaprophytic *Galeola hydra*, with its gigantic liana body. The physiological experimental task of substituting more powerful symbionts for relatively weak ones is accomplished in the case of *Cymbidium* by the use of *Hypochnus catonii* in place of the ordinary *R. repens* [*R.A.M.*, ix, p. 600], a process followed by a considerable extension and intensification of the coralloid holosaprophytic rhizome phase. The physiological and genetic implications of this phenomenon are concisely indicated.

ADDOMS (RUTH M.) & MOUNCE (F. C.). **Notes on the nutrient requirements and the histology of the Cranberry (Vaccinium macrocarpon Ait.) with special reference to mycorrhiza.**—*Plant Physiol.*, vi, 4, pp. 653–666, 2 pl., 2 figs., 1 diag., 1931.

Early Black cranberry plants from New Jersey bogs were grown for several months in sand cultures supplied with nutrient solutions containing nitrogen in the form of nitrate and ammonium, respectively, and with one lacking in all forms of nitrogen. Mycorrhiza were found in all the cultures, being least in evidence in the minus-nitrogen series. The small amount of vegetative growth in the minus-nitrogen cultures indicated that if nitrogen-fixation by the endophyte (*Phoma radicis*) [*R.A.M.*, viii, p. 325; ix, p. 398] occurred, it was quite inadequate as a source of nitrogen for the plants.

The mycelium of the endophyte was detected throughout the stem

system of the plant, including fruits and seeds. It forms a branching mass over the surface of the very small, hairless roots, the hyphae penetrating the epidermis and cortical parenchyma and forming mycelium in the cells. In the stem, the mycelium is most abundant in the parenchymatous cells, especially of the pith and cortex. The fungus often contains oil and glycogen, but nitrates could not be found, and the part played by the endophyte in the nitrogen metabolism of the plant has not yet been determined.

KÄRCHER (HEDWIG). **Kurze Mitteilung. Über die Kälteresistenz einiger Pilze und Algen.** [Short note. On the resistance to cold of some fungi and algae.]—*Planta*, xiv, 2, pp. 515–516, 1931.

Among other organisms surviving eight days' exposure to a temperature of −70° C. and 13 hours at −183° to −192° on malt agar cultures in test tubes were *Collybia velutipes*, *Schizophyllum commune*, *Armillaria mellea*, *Xylaria hypoxylon*, *Aspergillus niger*, and *Penicillium glaucum* [cf. *R.A.M.*, x, p. 572].

BECQUEREL (P.). **La vie latente des spores des bactéries et des moisissures.** [The latent life of the spores of bacteria and moulds.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 303–307, 1931.

The author states that his experiments showed that slowly dried spores of *Mucor mucedo*, *Rhizopus niger* [? *nigricans*], *Sterigmatocystis nigra* [*Aspergillus niger*], *A. glaucus*, *Bacillus subtilis*, *B. megatherium*, and beer yeast, which were kept in an almost absolute vacuum inside sealed test tubes, were entirely viable at the end of two years. Neither was the viability of the mould spores impaired by plunging the tubes containing them in liquid air (−190° C.) for 492 hours, and then in liquid hydrogen (−253° C.) for 77 hours prior to storing [see preceding abstract]. The dried spores of *B. megatherium*, *B. subtilis*, *Penicillium* sp., and *A. glaucus* were also shown to withstand a temperature of 135° C. for five minutes inside the vacuum tubes, and the direct action of boiling water or live steam at 110° for 15 minutes, while moist heat at 120° does not always kill them in 10 minutes.

In his opinion these experiments indicate that, contrary to Van Tieghem's views, the latent life of the spores is anaerobic, and is dependent on the impermeability of their outer integuments when dry, which preserves them from the action of external agents. This explains the fact that the spores may be preserved for a long time in absolute alcohol, chloroform, and dry irrespirable gases without losing any of their germinability.

WHITEHEAD (T.) & CURRIE (J. F.). **The susceptibility of certain Potato varieties to leaf-roll and mosaic infection.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 508–520, 1 pl., 1931.

Some details are given of field experiments in 1929 conducted for the purpose of determining whether any differences existed in the susceptibility of seven named potato varieties, two of which were included in trials in 1924 [*R.A.M.*, x, p. 48], to infection with

potato mosaic and leaf roll. In order to ensure uniform chances of infection, the varieties were randomized in the plots, and the sources of infection were provided by drills of diseased plants alternating with the varieties tested. Although mosaic was transmitted generally, the symptoms were so slight that percentage infection could not be determined and the apparent vigour of the plants was not appreciably affected; the tuber yield of the infected plants was, however, reduced by 0·8 to 24·4 per cent. by weight. Leaf roll infection, on the other hand, was very heavy, most varieties showing from 90 to 100 per cent. infection of the plants, and tuber infection (as shown in 1930) ranged from 77·3 to 99·9 per cent. Both haulm and tuber infection were much heavier than in 1924, this indicating a marked dependence upon seasonal factors affecting the breeding of insect vectors.

The experiments indicated that loss in yield due to leaf roll is the most reliable criterion of the susceptibility of a given variety, the degree of stunting or the number of rolled leaves on a plant giving no reliable indication in this respect. There was also evidence that the reduction in yield is less dependent on seasonal factors than percentage haulm or tuber infection, and that figures showing such losses have a more general applicability to other localities and seasons. On this assumption a table is appended, showing the susceptibility of fifteen named varieties, based on the 1924 and 1929 trials, in which the loss of yield ranged from 97·6 (Herald) to 26 (Field Marshal) and 14 per cent. (Up-to-Date) by weight. In the Field Marshal variety heavy losses of yield occurred when the plants were simultaneously infected with leaf roll and mosaic. Large tubers from such plants produced plants showing symptoms of crinkle, while the small tubers gave apparently pure leaf roll.

WHITEHEAD (T.). **Respiration of healthy and leaf roll Potatoes.** —*Nature*, cxxviii, 3240, p. 967, 1931.

A comparative study of the respiration rates of healthy and leaf roll potatoes at Bangor, North Wales, has shown that the respiration of the immature healthy tuber is higher than after maturation in storage, and again rises with the development of sprouts. On the first unfolding of the leaves there is a very sharp rise in the respiration rate, followed by a slight, gradual fall as new tubers are formed. A similar course may be traced in the infected potato, but with important differences in detail. The diseased immature tuber respires at a higher rate than the healthy one when first lifted, then falls, on storage, to a level slightly below that of the healthy mature tuber. On sprouting, the respiration rate of the diseased tuber lags behind that of the healthy one until the sprouts break into leaf, when the great increase in the liberation of carbon dioxide observed in the healthy plant is exceeded by the diseased one. The higher respiration rate of infected foliage is evident, therefore, before the occurrence of any rolling or excess accumulation of starch in the leaves, but not necessarily before the incipient accumulation of sugar. It remains at a higher level than the respiration of the healthy plant during the rest of the growing period.

Anaerobic respiration in nitrogen is unaffected by the virus, the tuber, diseased or otherwise, producing 70 to 80 per cent. of the carbon dioxide evolved under aerobic conditions. The respiratory changes during the life of the potato could thus be represented by similar curves for anaerobic and aerobic conditions.

PORTER (D. R.). **The infectious nature of Potato calico.**—*Hilgardia*, vi, 9, pp. 277–294, 1 col. pl., 6 figs., 1931.

Some details are given of the investigation during 1929–31 at the California Agricultural Experiment Station of the potato calico disease [*R.A.M.*, x, p. 264], which is stated to be present in every important potato-producing district of the State, in some counties of which it is steadily spreading. The experiments and observations were mainly carried out with the White Rose variety, and in some cases with seedlings. The infectious nature of the disease is claimed to have been established from the fact that natural spread has been observed in the field, the features of which (distance, rapidity, and direction) would indicate that insects may serve as vectors, and from artificial inoculations which were successful with unfiltered (but not with filtered) juice from diseased plants through superficial lesions in the leaves of healthy plants caused by needle punctures, or by rubbing them with sterilized cheesecloth, or with the fingers, moistened with the infective juice. The symptoms following natural or experimental infection were identical, and the minimum incubation period was about 15 days. There was some evidence, needing further confirmation, that the disease may also be transmitted by tuber grafting, and it was shown definitely that it is perpetuated by means of seed tubers.

In a small greenhouse experiment under partially controlled conditions, the yield of plants inoculated with calico was 19 per cent. less than of control plants raised from sister tubers, compared with losses of 31 and 16 per cent. recorded in the field in 1929 and 1930, respectively.

BURR (S.). **Sprain or internal rust spot of Potato (*B. rubefaciens*).**—*Ann. of Appl. Biol.*, xviii, 4, pp. 521–523, 1 pl., 1931.

In this brief note the author states that he has succeeded in producing sprain or internal rust spot lesions in the progeny of healthy potato tubers (Golden Wonder and Field Marshal) by growing them in pots of sterilized earth inoculated with emulsions of *Bacterium rubefaciens* [*R.A.M.*, viii, p. 398]. He also gives details of the successful re-isolation of *B. rubefaciens* from the tubers thus infected, thus complying with Koch's third requirement for establishing the pathogenicity of this organism.

SCHLUMBERGER [O.]. **Prüfung von Kartoffelsorten auf ihr Verhalten gegen Schorf im Jahre 1931.** [Testing of Potato varieties for their reaction to scab in the year 1931.]—*Mitt. Deutsch. Landw. Gesellsch.*, xlvii, 4, pp. 55–57, 1932.

Continuing his tests on the reaction of a number of potato varieties to scab [*Actinomyces scabies*] in Germany [*R.A.M.*, x,

p. 618], the writer found that, of those tested for the third time, Ackersegen and Dauerragis were resistant, and Berlichingen, Blaue Gelbfleischige, and Bismarck fairly so; the remaining eight varieties of this group, including Cellini, Frühe Ertragreiche, Prozentragis, Goldfink, and Vesta, proved susceptible. Among the varieties in the second year of testing Ök.-Rat Mathis and Ovalgelbe were the most promising, while the best of those tried for the first time were Modrow's Aal, Volkswohl, Sandkrone, and Rotweissragis. A certain reduction in the incidence of scab was effected by applications of caustic lime at the rate of 20 or 40 doppelzentner per hect., but a general adoption of this treatment cannot be recommended in the light of present knowledge.

KÖHLER (E.). **Der Kartoffelkrebs und sein Erreger (Synchytrium endobioticum [Schilb.], Perc.).** [The Potato wart and its agent (*Synchytrium endobioticum* [Schilb.] Perc.).]—*Landw. Jahrb.*, lxxiv, 5, pp. 729–806, 7 figs., 1931.

This is a very comprehensive survey of the author's studies, at the Biologische Reichsanstalt, Berlin-Dahlem, on the wart disease of potatoes (*Synchytrium endobioticum*), notices of which have been published from time to time [*R.A.M.*, xi, p. 261]. The following are the chief headings under which the subject is discussed. (1) An introductory description of the disease and its agent. (2) History and geographical distribution of the disease. (3) Morphology, biology, systematic position, and hosts of the fungus. (4) The problem of specialization. (5) The relations between parasite and host (infection, modifications in the type of excrescence, and factors governing resistance and susceptibility). (6) Methods of inoculation and technique of varietal tests. (7) Control by selection, soil disinfection, and legislation (with the citation of a number of German regulations).

A five-page bibliography is appended.

Wart disease of Potatoes.—*Min. of Agric. Leaflet* 105, 10 pp., 2 pl., rewritten October, 1931.

This is a revised account, brought up to date, of the potato wart disease (*Synchytrium endobioticum*) already noticed from the previous issue [*R.A.M.*, viii, p. 56].

Stand des Kartoffelkrebsauftretens in Oesterreich. [Status of the incidence of Potato wart in Austria.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931, Sondernummer*, p. 140, 1931.

During 1931 the situation in regard to the incidence of potato wart [*Synchytrium endobioticum*] did not alter materially in comparison with 1930 [*R.A.M.*, x, p. 125]. Fresh centres of infection were detected at Hohenems, Vorarlberg, and in two localities of Styria, but no economic importance is attached to these new developments.

NEUMANN (H.). **Ein Versuchsfeld zur Bekämpfung des Kartoffelkrebses.** [An experimental field for the control of Potato wart.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931, Sondernummer*, pp. 115–116, 1931.

A field some 1,000 sq. m. in extent, infested with potato wart [*Synchytrium endobioticum*], has been set aside near Frohnleiten,

Styria, for soil disinfection experiments [*R.A.M.*, vii, p. 664]. In 1931 the field was planted with the susceptible Alma variety, the crop being harvested on 11th September. Of the 3,000 plants in the field only 35 were free from infection, and these appeared, from the shape and colour of the tubers, to belong to a different variety. About 200 kg. of potatoes were harvested, i.e. approximately the quantity used for seed. It is evident that the plot is heavily and uniformly infested by *S. endobioticum* and well adapted to soil disinfection trials.

NEUMANN (H.). **Versuch über die Wirkung von Kupferkalkbrühe in verschiedener Konzentration gegen die Krautfäule (Phytophthora infestans) der Kartoffel.** [An experiment on the action of Bordeaux mixture in varying concentrations against late blight (*Phytophthora infestans*) of the Potato.]—*Oesterr. Zeitschr. für Kartoffelbau, 1931, Sondernummer*, pp. 133–137, 1931.

The results are tabulated and briefly discussed of an experiment in Styria in the control of late blight (*Phytophthora infestans*) on Juliperle, Böhm's Allerfrüheste, and Kipfler potatoes with two applications of Bordeaux mixture at 1, 1·5, and 2 per cent. All the treated plots gave increased yields over the controls ranging from 8 to 30, mostly 10 to 20 per cent., the gain being due, not to the formation of additional tubers but to the development of an abundance of large ones during the 8 to 14 days' protraction of the growing season. No appreciable advantage was derived from the use of concentrations above 1 per cent. Tuber rot occurred only on the untreated late maturing Kipflers [*R.A.M.*, xi, p. 71].

DOWSON (W. J.) & OLDAKER (C. E. W.). **The prevention of late or Irish blight of Potatoes.**—*Tasmanian Journ. of Agric.*, N.S., ii, 4, pp. 211–214, 1931.

The damage and loss caused by late blight of potato [*Phytophthora infestans*] in Tasmania in 1930–1 is stated to have been disastrous, and the authors suspect that a new series of severe late blight years, similar to that which prevailed from 1906 to 1911, is in progress. They recommend the adoption by the potato growers of preventive measures against the trouble, including among other things a wider spacing of the potato rows in the field, in order to allow a more effective moulding of the hills, a measure which has been shown in Great Britain to afford good protection to the tubers against infection by *P. infestans* spores.

BABBITT (D. M.). **Seed Potato treatment on a large scale.**—*Amer. Potato Journ.*, viii, 12, pp. 271–272, 1931.

During the summer of 1931 the treatment of seed potatoes was carried out on a co-operative basis at Deerfield, Cumberland County, New Jersey. By the use of a motor seed treatment machine furnished with a carrier to raise the potatoes from the mercury disinfecting solution, nine farmers were enabled to treat 765 sacks (of 150 lb.) in just over seven hours. The operations were conducted by four men and a boy. The tubers treated by this

method were used for the seed potato crop which is grown in Salem and Cumberland counties during the late summer and autumn.

BUCKHURST (A. S.) & FRYER (J. C. F.). **The problem of 'Potato sickness'. A report upon certain experiments.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 584–601, 2 pl., 1931.

A detailed account is given of field investigations in Lincolnshire, Yorkshire, and Lancashire, and of experimental work at the Plant Pathological Laboratory in Harpenden during 1929 and 1930 to determine the causes of 'potato sickness' of the soil [*R.A.M.*, xi, p. 202]. Pot experiments were carried out with potato-sick soil (1) untreated, (2) sterilized, (3) sterilized and inoculated with eggs of *Heterodera schachtii*, (4) sterilized and inoculated with *Corticium solani*, and (5) sterilized and inoculated with the eelworm and *C. solani*. The plants in series (1) developed the typical symptoms, but in all the others they appeared normal. In the next year the pots were replanted without any further treatment being given, when series (2) and (4) grew normally while series (1) failed and (3) and (5) hardly made any growth at all. The authors therefore concluded that *C. solani* is not a primary cause of the condition and suggest that the disease is due to attacks of *H. schachtii* in conjunction with a soil factor (so far undetermined) which inhibits a vigorous early growth of the potato roots and which may be a nutritional defect. Of various soil dressings tested in the field none give any significant gain in crop except naphthalene on plots at Kirton.

O'BRIEN (D. G.) & PRENTICE (E. G.). **A nematode disease of Potatoes caused by Heterodera schachtii (Schmidt).**—*West of Scot. Agric. Coll. Res. Bull.* 2, 63 pp., 23 pl., 5 diag., 1931.

This is a detailed account of the authors' investigation of a serious disease of potatoes in the west of Scotland, the primary cause of which was shown to be the eelworm *Heterodera schachtii*. Diseased plants are commonly attacked by secondary organisms, among which *Rhizoctonia* [*Corticium*] *solani* is the chief. There was strong evidence that the production of 'nematode nests', i.e., localized areas in which the potato plants are very unhealthy and die off prematurely [? potato-sick soil: cf. preceding abstract], is directly related to the degree of infestation of the soil by the eelworm, accompanied by heavy infection with secondary parasites.

MILLARD (W. A.), BURR (S.), & JOHNSON (L. R.). **Potato sickness.** *Gard. Chron.*, xci, 2350, pp. 28–29, 3 figs., 1932.

Details are given of the writers' experiments to determine the relative importance of the eelworm *Heterodera schachtii*, the stem canker fungus (*Corticium solani*), and the black dot fungus (*Colletotrichum atramentarium*) in the causation of potato sickness [see preceding abstracts]. It is evident from the results of these tests (which covered a period of two years) that the disease is due mainly to the attacks of the eelworm which are often aggravated by infection of the young shoots by *Corticium solani*. The

part played in the development of potato sickness by *Colletotrichum atramentarium* is considered to be insignificant.

FUKUSHI (T.). **On the intracellular bodies associated with the dwarf disease of Rice plant.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 1, pp. 35–41, 5 figs., 1931.

Dwarf disease of rice in Japan is characterized by small, elongated, chlorotic areas along the leaf veins and by generalized stunting, followed by excessive tillering and a dark green coloration. The chlorotic areas (white in transmitted light), which develop before the leaves unfurl, elongate and extend along the leaf parallel to the midrib, forming fine, interrupted streaks, ranging from mere dots to several millimetres in length and 0·2 to 1 mm. in width. Plants infected in the initial stages of growth become severely stunted and produce only a few small, worthless panicles, if any. The disease is transmissible by the leafhopper, *Nephotettix apicalis* var. *cincticeps*, but not through the seed, the soil, or by mechanical inoculation with infected juice or leaf mutilation.

Both fresh and fixed material of dwarfed rice plants revealed round to oval or irregularly shaped bodies, measuring 3 to 10 by 2·5 to 8·5 μ and thus considerably exceeding in size the host nuclei (2·5 to 3·5 μ in diameter) near which they are situated. These structures stain readily with various reagents and are believed to be probably analogous to those associated with a number of virus diseases of plants [*R.A.M.*, ix, p. 538].

TENG (S. C.). **Observations on the germination of the chlamydospores of Tilletia horrida Tak.**—*Contrib. Biol. Lab. Sci. Soc. of China*, Bot. Ser., vi, 9, pp. 111–114, 1 pl., 1931.

The writer's observations in August, 1931, on the germination of chlamydospores of *Tilletia horrida* [*R.A.M.*, vii, p. 75], collected from rice in Chekiang, China, about 11 months earlier, showed that the thick wall is ruptured by the promycelium, which is mostly simple, apparently non-septate, 7 μ in diameter and 35 to 525 μ in length. The sporidia are long, cylindrical, often curved, 35 to 60 by 2 μ, and produced in whorls on the tip of the promycelium. Some of them give rise to conidia directly or to much branched hyphae bearing conidia, which are allantoid and 10 to 14 by 2 μ in diameter.

SHARPLES (A.) & SANDERSON (A. R.). **The root disease problem on old Rubber areas in Malaya.**—*Rubber Res. Inst. Malaya, Bull.* 3, 43 pp., 3 pl., 3 diags., 1931.

A full account is given of further investigations into the wet root rot of *Hevea* rubber in Malaya caused by *Ganoderma pseudoferreum* [*R.A.M.*, vi, p. 507; xi, p. 72], the results of which may briefly be summarized as follows.

The disease occurs on *Hevea* rubber from six years of age upwards but seldom becomes prominent before 10 years; it is not limited to any particular soil type or site and is by far the most important agent in the causation of root disease in old rubber trees. In one old rubber plantation 346 trees on five acres were examined, of which 67 were badly diseased, 64 by *G. pseudoferreum* and 3 by

Ustulina zonata. Counting milder cases, the total percentage of disease was nearly 60, almost all due to *G. pseudoferreum.* In an examination of 1,200 trees over 21 years of age, 77·7 per cent. of the 112 cases of root diseases found were due to this fungus. A large percentage of the diseased trees have diseased lateral roots only. The typical manner of spread is entirely by underground root contact; the uppermost laterals usually become infected along their under surface, and as they cross and come in contact with the roots of neighbouring trees these in turn become attacked by the rot. Masses of adventitious roots are formed after the disease has become severe. Extension in the bole may occur to a height of 10 ft. or more.

Single tree isolation being ineffective as a means of control, group treatment is recommended: the disease cannot be checked merely by exposing diseased laterals to a distance of two or three feet away from the bole, but it can be eradicated if expense is no object. Once the fungus penetrates the bole the tree cannot be saved. Emphasis is laid on the importance of following up and extracting diseased lateral roots during treatment, and in early cases this will enable many trees to be saved. As a wound cover a mixture of 1 pint of asphaltum (grade DX) with 1 pint of kerosene was found to be economical and effective. Diagrams are given to show the methods of isolation and treatment recommended.

Duché (J.) & Heim (R.). **Recherches sur la flore mycologique des sols sableux.** [Researches on the fungal flora of sandy soils.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 431–458, 1 pl., 5 figs., 1931.

The mycological examination of the sandy soil of the dunes on the Cotentin peninsula [northern France] showed the presence in it of a fairly abundant fungal flora, and thirteen species of fungi were isolated and studied in culture. Most prevalent were *Actinomyces albus, Absidia glauca, Penicillium chrysogenum*, and *P. lilacinum*, the three last named in sand in the absence of all other vegetation. Very common also is *Trichoderma koningi* [*R.A.M.*, x. p. 551], which is renamed *Acrostalagmus koningi* comb. nov. on the grounds that its conidia are covered with a mucous sheath easily dissolving in water, and that the shape of its phialids is fusiform and rather rounded at the apex, instead of being oblong-conical and acuminate, as characteristic of the genus *Trichoderma*. As revised by the authors the latter genus should now only contain *T. lignorum*. The other species isolated comprise *Actinomyces griseus, Monilia* sp., *Hormodendron cladosporioides, Haplotrichum violaceum* n.sp., *Penicillium mangini* n. sp., and *Spicaria carnea* n. sp. Descriptions are given of the new species in French, and notes are added on their cultural behaviour and that of *Hormodendron cladosporioides.*

Chapman (G. W.). **The relation of iron and manganese to chlorosis in plants.**—*New Phytologist*, xxx, 4, pp. 266–283, 1931.

The form of chlorosis considered in this paper, i.e.. that dependent on the iron or manganese metabolism of the plant,

consists in a yellowing of the leaves accompanied, in severe cases, by partial death of the roots and premature defoliation [cf. *R.A.M.*, vi, p. 284; ix, p. 43]. The condition is only manifested in an acute form by certain plants growing on calcareous or manganiferous soils. Iron deficiency does not appear to be the primary cause of this type of chlorosis, and the present investigations were undertaken with a view to reconciling several apparent discrepancies in the current theories as to its origin.

The 'water-soluble' iron content of the soil was proved not to be directly related to chlorosis. Ash analyses showed that chlorotic wood from plants grown in the field always contains an abnormally large amount of iron, while chlorotic leaves usually contain exceptionally little; the plant as a whole contains more iron than normal. The sap from the wood of chlorotic plants is very low in iron, which is probably present in the divalent form. The hydrogen-ion concentration of the sap obtained from the wood was found to bear no relation to chlorosis. From field experiments on the transport of iron and manganese in the plant it was found that if chlorotic apple or pear trees are injected with manganese a year before spraying with iron, the latter does not spread in the leaves but produces green spots [cf. ibid., x, p. 676], a similar effect resulting from the application of a mixture of manganese and iron. Manganese (0·01 and 0·0025 gm. per l.) was found to be capable of inducing chlorosis in *Pinus maritima* without altering the iron content of the ash of the leaves or stem, which was higher, on a dry weight basis, in chlorotic than in normal plants. The manganese content of the needles was found to be much higher than that of the wood. An excess of calcium combined with manganese rapidly proved fatal, whereas without manganese large doses of calcium are tolerated.

BELL (A. F.). **Work of the Division of Pathology.**—*Thirty-first Ann. Rept. Queensland Bureau of Sugar Exper. Stat.*, pp. 37–41, 1931.

During the period under review a destructive new disease appeared on sugar-cane in the Mackay district of Queensland. It is tentatively referred to as 'dwarf disease' on account of the characteristic and very pronounced dwarfing produced. The symptoms somewhat resemble those of Fiji disease, but instead of galls the short, stiff leaves bear fine, yellowish, longitudinal stripes, quite distinct on the younger leaves but gradually becoming masked on passing to the older ones. The stripes are usually ½ to 2 in. in length, but may reach 6 in.; they follow the direction of the veins and are about $\frac{1}{16}$ inch wide, but may run together to give comparatively broad yellowish bands, particularly at the leaf margins. The markings are always more pronounced at the base of the leaves and are rarely evenly distributed across the leaf blade. Healthy and diseased canes of all sizes are frequently found in the same stool; following these cases of apparently secondary infection, growth soon ceases, and the top of the stalk tapers off to a point, giving rise to a stiff fan-like top. The spindle and younger leaves typically become twisted and deformed and are of a lighter colour than normal. Infected cuttings produce

stools consisting of stunted, short-lived shoots which form no cane and resemble a tuft of grass. There is no marked shooting at the eyes or production of aerial roots on the part of diseased stalks, which on being cut open show no internal discoloration.

The outbreak appeared to be limited to about ten farms, with a maximum infection in any one field of under 0·5 per cent. Only the varieties P.O.J. 2714 and P.O.J. 213 (on one farm) were affected. The origin of the disease is unknown, but the available evidence strongly discounts the probability of its introduction from abroad in imported cane setts.

Gumming [*Bacterium vascularum*: *R.A.M.*, xi, p. 204] continued to be the most important cane disease in southern Queensland. The possibility of soil transmission was tested by incorporating diseased material in the soil and, after nearly three months, planting the plot with healthy setts of the susceptible varieties H.Q. 426 and B. 208. No trace of the disease resulted. A varietal resistance trial established beyond question the high resistance of P.O.J. 2878, which should play an important part in the control of the disease.

In experiments on the transmission of Fiji disease reported by Mr. R. W. Mungomery (on p. 47) one definite instance of secondary infection pointed to the common mealy bug (*Trionymus sacchari*) being responsible for the spread of the disease, but this has not yet been confirmed. *Aphis maidis*, *A. sacchari*, and *Perkinsiella saccharicida* failed to transmit infection.

Of the other items referred to in this report, it may be mentioned that the investigation of leaf scald [*Bact. albilineans*: ibid., x, p. 339] has now been constituted the chief problem of the Division of Pathology.

PRIODE (C. N.). **Notes on diseases affecting P.O.J. Canes in Cuba.**—Abs. in *Facts about Sugar*, xxvii, 3, pp. 136–137, 1932.

Addressing the Association of Sugar Technologists of Cuba in 1931, C. N. Priode stated that a few cases of mild mosaic have occurred in the normally highly resistant P.O.J. 2878 variety in heavily infected sections [*R.A.M.*, x, p. 271], but generally speaking this variety has satisfied the most exacting requirements in the field. The mosaic leaf pattern shown by P.O.J. 2878 is stated to differ from that exhibited by the other canes. Considerable stunting may accompany mosaic in P.O.J. 2714.

The F.C. seedlings, D. 109, Papua, and others are highly susceptible to eye spot [*Helminthosporium ocellum*: ibid., xi, p. 4], which spread to the P.O.J. canes near by, 2722 being the most resistant. Excepting 2221, the P.O.J. canes are highly resistant to brown stripe [*Helminthosporium stenospilum*: ibid., viii, p. 404]. At Baragua P.O.J. 2878 and 2722 were found to be very susceptible to pokkah-boeng [*Gibberella moniliformis*: ibid., xi, p. 4, and below, p. 332], but little importance is attached to this disease after four to five years' experience. Red stripe [*Phytomonas rubrilineans*: see next abstract] attacks the P.O.J. 2725, 2883, 2878, and 2727 varieties, but only in a mild form.

Root disease, associated with a combination of unfavourable

growth factors [ibid., x, p. 753], failed to affect the output of the vigorous P.O.J. canes, whereas Cristalina and others died out. The P.O.J. varieties are the only ones in Cuba showing stem galls [ibid., xi, p. 265].

MARTIN (J. P.). **Cane disease control through adjustment of plantation practices.**—*Internat. Sugar Journ.*, xxxiii, 395, pp. 531–532, 1931.

In this account of a paper read at the annual meeting of the Hawaiian sugar technologists the author, it is stated, classifies all diseases of sugar-cane as non-parasitic, parasitic, or virus in origin. Emphasis is laid upon disease resistance manifested by the host, and upon the necessity of studying the merits not only of plant canes but also of ratoons. The main body of the paper consists of two comprehensive lists, one of the diseases and their causes and the other of plantation measures for control. Thus, for example, leaf scald (*Bacterium albilineans*) [*R.A.M.*, x, p. 503] affects primarily the stalks and leaves, and is treated by planting resistant varieties, using healthy cuttings, roguing, sterilizing the knives, and subjecting the cuttings to the hot water treatment (20 minutes at 52° C.). Pahala blight [ibid., viii, p. 136], due to iron or manganese deficiency, responds to applications of manganese and sulphur. Red stripe (*Phytomonas rubrilineans*) [ibid., ix, p. 407; x, pp. 128, 751] is primarily a leaf disease: treatment consists in planting resistant varieties, in adopting suitable methods to favour cane growth, and early planting and harvesting to avoid having young cane during the rainy season.

PETRAK (F.). **Mykologische Notizen. XI.** [Mycological notes. XI.]—*Ann. Mycol.*, xxix, 5–6, pp. 339–597, 1931.

Critical and taxonomic notes are given on 50 species of fungi, including a number from the West Indian region collected by Ciferri and others. The list comprises one new genus and 27 new species.

MOESZ (G.). **Mykológiai közlemények. VIII. Közlemény.** [Mycological notes. Note VIII.]—*Bot. Közlemények*, xxviii, 6, pp. 161–174, 11 figs., 1931. [German summary.]

Latin diagnoses are given of some new species of fungi collected in Hungary. Among others the following may be mentioned. *Diplodina agaves* Moesz & Göllner forms subspherical, greyish-brown spots with brown margins, 4 to 7 cm. in diameter, on living leaves of *Agave americana*. The pycnidia are black, with a conical or papilliform ostiole, 187 to 312 μ in diameter, and the conidia elliptical to cylindrical, rounded at both ends, straight or slightly curved, with one median septum, bi- to pluriguttulate, measuring 12·5 to 15 by 3 to 4·5 μ. *Colletotrichum digitalis* (which name the author gives to E. Rostrup's *Gloeosporium digitalis*) was found on cultivated *Digitalis ferruginea*.

UNAMUNO (L. M.). **Notas micológicas.** [Mycological notes.]—*Bol. Soc. Españ. Hist. Nat.*, xxxi, 10, pp. 701–710, 1931.

Continuing his descriptions of fungi collected in various parts of Spain [*R.A.M.*, x, p. 210], the writer gives Latin diagnoses of

seven new species, of which the following may be mentioned. *Phyllosticta halepensis*, occurring on the dry leaves of *Sorghum halepense* [*Andropogon halepensis*], is characterized by amphigenous, punctiform, globose or ellipsoid, black pycnidia, 62·8 to 88·5 by 68·5 to 74·5 μ in diameter; and hyaline, oblong to ellipsoid, *Macrophoma*-like, straight or curved, bi- to triguttulate pycnospores, measuring 8·5 to 12 by 3·2 to 3·8 μ. *P. lusitanica* forms reddish-brown, irregular or rounded lesions, later turning white, with a zone of various colours, on the upper side of the leaves of *Quercus lusitanica* var. *faginea*. The pycnidia are globose to conical and are sparsely distributed (10 to 16 per lesion); the pycnospores are hyaline, straight or very rarely curved, ellipsoid, oblong, or conical, bi- to triguttulate (usually the former), and measure 5·7 to 8·5 by 1·5 to 2 μ; the linear, hyaline sporophores are 10 to 14 μ long. *Septoria monspessulani* forms brownish-red, circular or angular spots, 0·5 to 1 mm. in diameter, with white centres, on living leaves of *Acer monspessulanum*. The pycnidia are sparsely distributed (1 to 2 per spot), brownish-black, sphaeroidal, and 54·2 to 57 μ in diameter; the pycnospores are hyaline, filiform, straight, curved, or flexuose, tapering towards the apex, biseptate, pluriguttulate, and measure 25 to 34·2 by 1·5 to 1·8 μ.

Other items of interest include *P. albo-maculans* on quince leaves, the fungus being new to Spain and not previously reported on this host; *S. antirrhini* on *Antirrhinum majus* [ibid., iv, p. 95]; *S. briosiana* on wheat leaves, hitherto known only from northern Italy; *S. populi* on *Populus nigra* leaves; *S. rosarum* on rose leaves [ibid., vi, p. 33], a new record for Spain; *S. salicicola* in conjunction with *Melampsora ribesii-viminalis* on leaves of *Salix viminalis* [cf. ibid., viii, p. 347]; and *Diplodia guineae* on dry leaves of *Lolium perenne*, a hitherto unreported host.

HARA (K.). **Materials for the fungus-flora of Nippon 2.**—*Fungi* (*Nippon Fungological Soc.*), i, 2, pp. 13–22, 2 pl., 1 fig., 1931.

Limacinia japonica Hara n. sp., occurring on *Citrus unshiu*, *Eurya ochracea*, *E. japonica*, and *Quercus glauca*, is characterized by an amphigenous, effused mycelium; branched, septate hyphae 4 to 6 μ thick; spherical or depressed-globose, ostiolate, setose perithecia, 120 to 170 μ in diameter; ovate or elliptical asci measuring 46 to 66 by 15·4 to 35 μ, and containing 4 to 8 vermiform or cylindrical, hyaline, straight or curved, 6- to 7-septate ascospores, 28 to 37 by 5 to 8 μ.

Hypnocapnodium mikanum Hara n. sp. (*Meliola citri* p.p.) [*R.A.M.*, x, p. 492] on *C. sinensis-brasiliensis* and *C. unshiu* is characterized by a widely effused mycelium, covering the whole surface of the leaves and branches; brown, filiform, branched, septate hyphae, 3 to 7 μ thick; conidia of *Triposporium* type with three or four arms; globose or depressed-globose, setose pycnidia, 150 to 200 μ in diameter; elliptical or ovate, hyaline stylospores, 3 to 6 by 1·5 to 2 μ; spherical or depressed-globose, ostiolate, setose perithecia, 110 to 150 μ in diameter; ovate, cylindrical or clavate asci, 60 to 80 by 12 to 20 μ, containing 8 elliptical or fusiform, hyaline, triseptate ascospores, 20 to 25 by 6 to 8 μ.

Aithaloderma camelliae Hara n. sp. forms black, irregular spots over the whole leaf surface of *Camellia japonica*. The spherical or depressed-spherical, dark brown, ostiolate, setose perithecia of the fungus measure 80 to 130 μ in diameter. The elongated-oval, ovate, or clavate, stipitate asci measure 32 to 50 by 16 to 24 μ and contain 2 to 5 clavate, fusiform, or cylindrical, hyaline, 5- to 6-septate ascospores, 19 to 38 by 5 to 7 μ.

The spots formed on *Citrus unshiu* by *Antennella citrina* Hara n. sp. are black, orbicular, often confluent, tomentose, and cover the whole surface of the leaves and twigs. The hyphae of the fungus are filiform, septate, branched, 3 to 4 μ in thickness, without hyphopodia. The pycnidia are cylindrical, simple or branched, and the elliptical or oval, hyaline stylospores measure 2 to 3 by 0·8 to 1 μ. The spherical or ovoid perithecia, measuring 60 to 110 μ in diameter, are furnished with a simple or branched stipe. The oval or obclavate asci are stipitate, 50 to 60 by 12 to 20 μ, and contain 3 to 6 clavate or vermiform, 5-septate, hyaline ascospores measuring 36 to 40 by 6 to 7 μ.

The following new species are also described: *Meliola osmanthi-aquifolii* on *Osmanthus aquifolium*; *H. quercifolium* on *Q. glauca* and *Q. myrsinaefolia*; *Aithaloderma phyllostachydis* on *Phyllostachus reticulata* and *Arundinaria simoni*; and *Aithaloderma japonica* and *Treubiomyces japonicus* on *Q. glauca*.

SIDERIS (C. P.). **The classification of Pythium.**—*Science*, N.S., lxxiv, 1928, pp. 596–597, 1931.

Attention is drawn to the practical inconvenience and confusion likely to result from Sparrow's proposed transference of the lobulate species of *Pythium* to *Rheosporangium* and of those with spherical sporangia to *Sphaerosporangium* [*R.A.M.*, x, p. 342]. If this system were adopted there would be danger of leaving no species in *Pythium* itself. The writer reaffirms the advantages of the classification proposed by him [ibid., ix, p. 561; xi, p. 129].

WAGER (V. A.). **Diseases of plants in South Africa due to members of the Pythiaceae.**—*S. Africa Dept. of Agric. Sci. Bull.* 105, 43 pp., 18 figs., 1931.

The Pythiaceae are stated to have received scanty attention in South Africa previous to the present investigations, which deal with a number of diseases newly recorded for the country.

Foot rot of papaw is fairly common and has usually been found to be due to *Pythium ultimum* [*R.A.M.*, x, p. 770], but *P. aphanidermatum*, *P.* (?) *splendens*, *P. irregulare* [ibid., x, p. 740], and *P. spinosum* [ibid., vii, p. 244] were also isolated from infected plants. These fungi are weak parasites that attack trees debilitated by adverse climatic or soil conditions, frost being apparently a specially important factor in promoting invasion. Foot rot is usually first observed on 1½ year-old trees, though both younger and older ones may be affected. The leaves turn yellow, die prematurely, and drop off; the newly formed foliage is abnormally small with very short petioles; most of the flowers fail to set and the fruits are small and generally do not ripen. At an advanced

stage of the disease only a small bunch of leaves remains at the apex of the trunk, and finally complete defoliation ensues. For a short distance above and below soil level the base of the trunk is soft and rotten, and diseased trees are readily pushed or blown down. Infection does not seem to spread rapidly, often occurring in quite a scattered form, while entire recovery is not uncommon. Foot rot of papaws has been reported from the western, eastern, and northern Transvaal, the Cape, and Natal. At Mount Edgecombe, the symptoms differ from those described above in the fact that the base of the trunk remained sound until the final stage, while the roots were soft and rotten. *P. ultimum* was further isolated from peanuts, witch weed (*Striga lutea*), asters (*Callistephus chinensis*), and Iceland poppies (*Papaver nudicaule*) suffering from wilt, rhubarb affected by crown rot, and sweet potato showing symptoms of soft rot [ibid., vi, p. 749]; the last-named host was also attacked by *P. aphanidermatum*. *P. ultimum* was found to remain alive for at least a year in the soil.

'Leak' or soft rot of potatoes is caused by *P. aphanidermatum* [cf. ibid., iii, p. 476], which has also been found on wilting tobacco plants. Inoculation experiments showed that this fungus is capable of causing a rapid and complete rot of potato tubers, the symptoms being most marked at a temperature of 35° C. Rhubarb in the Transvaal and Cape Provinces is occasionally infected by *Phytophthora parasitica* var. *rhei*, which causes a crown rot similar to that occurring in the United States [ibid., ii, p. 435]. *P. cambivora* was isolated from the roots of avocado trees showing symptoms of die-back in the eastern Transvaal, but the disease is considered to be primarily due to unfavourable soil conditions, since inoculation tests on young, vigorous plants gave negative results. *P.* (?) *parasitica* was isolated from a species of *Cotyledon* showing a purple discoloration of the leaves which became soft and dropped.

P. citrophthora was isolated from a grape-fruit trunk affected by gummosis and collar rot. The same organism had previously been found causing brown rot of citrus fruits, but this is the first record in S. Africa of its isolation from a diseased stem. *Pythium irregulare*, isolated from decaying citrus fruits, subsequently proved unable to produce a rot on inoculation into sound oranges.

P. (?) *artotrogus* [ibid., x, p. 740] was isolated from wilted Shirley poppies (*Papaver rhoeas*) and snapdragons (*Antirrhinum majus*) at Pretoria, but the negative results of inoculation tests suggest that the fungus is only a saprophyte on these hosts.

NISIKADO (Y.). **Vergleichende Untersuchungen über die durch Lisea fujikuroi Saw. und Gibberella moniliformis (Sh.) Winel. verursachten Gramineenkrankheiten. (Vorläufige Mitteilung.)** [Comparative investigations on the diseases of Gramineae caused by *Lisea fujikuroi* Saw. and *Gibberella moniliformis* (Sh.) Winel. (Preliminary note).]—*Ber. Ohara Inst. für Landw. Forsch.*, v, 1, pp. 87–106, 4 pl., 2 graphs, 1931.

Inoculation experiments were carried out at the Biologische Reichsanstalt, Dahlem, on rice and maize seedlings with a view to

determining the relationships between *Lisea fujikuroi* and *Gibberella moniliformis* [*R.A.M.*, ix, p. 54; x, p. 626], as well as those of their imperfect stages to other representatives of the *Fusarium moniliforme* group.

Not only *L. fujikuroi*, the causal organism of the 'bakanae' disease of rice, but also *F. moniliforme* var. *majus*, the agent of pokkah-boeng of sugar-cane [see above, p. 327], produce hypertrophy of both rice and maize seedlings. Notwithstanding slight differences of pathogenicity in the various isolations of these two fungi, there seems to be no justification for their separation under different names.

The author considers that the pathological evidence obtained from these experiments agrees with Wollenweber's views that *F. moniliforme* var. *majus* is the conidial form of *L. fujikuroi*, and that the latter should be transferred to the genus *Gibberella* as *G. fujikuroi* (Saw.) Wr., not to be confused with *G. moniliformis*.

[This paper is also published in *Zeitschr. für Parasitenkunde*, iv, 2, pp. 285–300, 2 figs., 2 graphs, 1932.]

White (Dorothy M.). **(Uredinales) Host-index.**—*North American Flora*, vii, 13, pp. 849–969, New York Botanical Garden, 1931.

An alphabetical list is given of the hosts of the Uredinales enumerated in previous parts of the North American Flora [*R.A.M.*, vii, p. 61].

Hiratsuka (N.). **Bibliography of Uredinales in Japan.**—*Fungi (Nippon Fungological Soc.)*, i, 2, pp. 2–8, 1931.

This continuation of the bibliography of Uredinales in Japan [*R.A.M.*, xi, p. 128] comprises 113 titles of papers published between the years 1912 and 1924.

Hiratsuka (N.). **Zweiter Beitrag zur Uredineen-Flora von Südsachalin.** [Second contribution to the Uredine flora of South Saghalien.]—*Trans. Tottori Soc. Agric. Sci.*, ii, 3, pp. 233–246, 1931.

Taxonomic and geographical notes are given on a further 53 rusts occurring in South Saghalien [*R.A.M.*, ix, p. 810].

Meurs (A.). **Ziekten der Tabak.** [Tobacco diseases.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, 73, pp. 5–19, 1 diag., 1931.

During 1931 it was necessary to discard about 11 per cent. of the total number of tobacco seed-beds on 65 estates in Sumatra on account of slime disease [*Bacterium solanacearum*: *R.A.M.*, x, p. 561]. The four estates remaining free from the disease were for the greater part situated on black dust soil, while the 24 most severely affected were on sand and clay. The average percentage of slime disease on 65 estates was 10·4, the minimum being 1·4 and the maximum 30. The nine sections from which no field infection

was reported were mostly situated on primeval forest or virgin soil, or on the alluvial or subhydric white soils.

Phytophthora nicotianae necessitated the clearance of some 3,300 seed-beds, chiefly in two districts on liparite soils.

Stem scorch (*Pythium* spp.) occurred in over 200 seed-beds which were cleared away in consequence, and was observed on field plants on 51 estates. The disease was very troublesome on a number of estates in the plains, while on some up-country plantations on red dacite soils it involved the sacrifice of half the stand. The use of imported seedlings is believed to be largely responsible for these virulent attacks. As in 1930, the highly infectious Rotterdam B disease was chiefly observed on white alluvial soils.

The so-called 'korab' disease of tobacco [ibid., viii, p. 554] appears to be identical with the 'pock' disease described by Jensen (*Proefstat. voor Vorstenlandsche Tabak, Meded.* 40, 1920), but distinct from that reported by Iwanowski and Poloftzoff (*Mém. Acad. Imper. Sci. St. Petersburg*, Sér. 7, xxxvii, 7, 1890) which is attributed to climatic conditions.

THUNG (T. H.). **Phytopathologische Waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1930—30 April 1931.—*Proefstat. voor Vorstenlandsche Tabak, Meded.* 71, pp. 28–46, 3 plans, 1931.

It was ascertained in the previous year that tobacco plants affected by the 'kroepoek' [leaf curl] disease [*R.A.M.*, x, p. 61] yield less satisfactory burning material than healthy ones from the same field, a characteristic which appears from chemical analysis to be correlated with the distribution of organic substances in the leaf. The length and quality of the leaf, as well as the amount of yield, were also found to be reduced by the disease.

Details are given of the methods of controlling the lanas disease (*Phytophthora*) [*nicotianae*] by cultural practices and the eradication of diseased plants which might serve as centres of infection.

Mildew [*Erysiphe cichoracearum*] was prevalent during the period under review, and studies are in progress to discover a substance within the sulphur group combining efficacy against the fungus with economy in application.

HOLMES (F. O.). **Local lesions of mosaic in Nicotiana tabacum L.**—*Contrib. Boyce Thompson Inst.*, iii, 2, pp. 163–172, 3 figs., 1931.

In this paper [which is in continuation of his studies on the virus of tobacco mosaic: *R.A.M.*, x, p. 212] the author give details and illustrations of a method of iodine staining of inoculated leaves which renders the local lesions very conspicuous. On Turkish tobacco (*Nicotiana tabacum*), in particular, which does not develop necrotic spots on inoculation with the mosaic virus but only diffuse yellowish spots, this method showed the lesions well and revealed the points of infection even when environmental conditions were such as to render the yellowish spots indistinct or invisible in the living leaf. Staining the inoculated leaves collected

at various times of the day indicated that the virus inhibits both the formation and the translocation of starch within the infected tissues. There was also evidence that under the conditions of the experiments the virus in the lesions is locally present in high concentration.

In discussing the results of the work, it is pointed out that this method constitutes a useful means for the investigation of the movement of the virus in its host. The pattern of the lesion in stained leaves is believed not to coincide exactly with the distribution of the virus at the time of collection, but more nearly represents the location of the virus somewhat earlier.

SAMUEL (G.). **Some experiments on inoculating methods with plant viruses, and on local lesions.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 494–507, 3 pl., 1931.

The results of the experiments briefly described in this paper [which were conducted at the Wisconsin University] showed that in addition to tobacco mosaic [*R.A.M.*, vi, p. 501; viii, p. 138] the following viruses, namely, cucumber mosaic [ibid., x, p. 410], spot necrosis of tobacco [ibid., x, p. 682], ring spot of tobacco, *Petunia* mosaic [ibid., xi, p. 133], and yellow tobacco mosaic [ibid., x, p. 410], are more effectively transmitted to tobacco by a light rubbing of the leaves, without visible wounding, than by needle scratching. Some of these viruses form local lesions of a definite type, the character and number of which is influenced by temperature, age of the leaf inoculated, and other factors. These lesions, the development of which was studied by means of the iodine-staining method [see preceding abstract], may prove to be of value in quantitative studies of the viruses; they can be followed particularly well in the case of yellow mosaic. An intimate relation between the vascular system and the path of travel of the virus is made strikingly evident by this staining method.

LOJKIN (MARY) & VINSON (C. G.). **Effect of enzymes upon the infectivity of the virus of Tobacco mosaic.**—*Contrib. Boyce Thompson Inst.*, iii, 2, pp. 147–162, 1931.

The experiments described in some detail in this paper [the results of which are shown in tabular form] were made to determine the action of certain enzymes on the virus of tobacco mosaic, as judged from their effect on the infectivity of solutions of the acetone and lead acetate precipitates of the virus [*R.A.M.*, x, p. 761]. Under the conditions of the tests emulsin, pepsin, or yeast extract did not affect the infectivity of the virus, while trypsin markedly inactivated it, this effect being at least as strong when trypsin was used alone as in combination with other enzymes. Pancreatin was only slightly effective, and papain was especially effective in neutral phosphate solution. Erepsin reduced the infectivity of the virus only after an incubation of several days. None of the enzyme solutions inactivated the virus in untreated juice from either fresh or frozen plants, and the capacity of the enzymes to reduce the infectivity of the virus was destroyed by boiling.

The results of these experiments are believed to indicate that the tobacco mosaic virus is of the order of a simple protein, but possibly less complex.

SHEFFIELD (Miss F. M. L.). **The formation of intracellular inclusions in Solanaceous hosts infected with aucuba mosaic of Tomato.**—*Ann. of Appl. Biol.*, xviii, 4, pp. 471–493, 9 pl., 1931.

This is a detailed and fully illustrated account of the formation of the intracellular inclusions previously briefly described in *Solanum nodiflorum* plants inoculated with aucuba mosaic of the tomato [*R.A.M.*, ix, p. 538], as seen by the author in this and in several other Solanaceous hosts, namely, *S. nigrum*, *Hyoscyamus niger*, tobacco, and tomato. In all these plants the development of the inclusions was very similar, and the investigation fully confirmed the conclusion formerly arrived at that these bodies are not living organisms, but the product of the reaction of the host cells to the virus; they may, however, contain the etiological agent of the disease. The protein crystals into which the body ultimately breaks down are stated to dissolve after some months.

In *H. niger* the intracellular inclusions are confined to the chlorotic areas where they are abundant in all tissues, while in the other species studied they are distributed over the green and the yellow tissues. They are very abundant in the hairs, less so in the epidermis, and very rare in the palisade and spongy tissues. In *H. niger* the development of the palisade tissue is arrested, but in the other species the effect on this tissue is not so obvious, although growth is retarded.

LESLEY (J. W.). **The resistance of varieties and new dwarf races of Tomato to curly top (western yellow blight or yellows).**—*Hilgardia*, vi, 2, pp. 27–44, 1931.

In tests conducted in California some tomato varieties of dwarf habit and also Red Pear, a variety of standard habit, exhibited some degree of resistance to curly top or yellows [*R.A.M.*, x, p. 415] when exposed to natural infestation by the leafhopper *Eutettix tenella*. In moderately severe epidemics the average loss of plants in five trials in four seasons in two localities amounted to 42 per cent. in resistant dwarf varieties, and 62 per cent. in the susceptible Santa Clara Canner, Norton, and Stone varieties. All the varieties became nearly 100 per cent. diseased in very severe epidemics. Attempts to obtain resistant lines from commercial varieties of standard habit failed, and no increase of resistance resulted from crossing a resistant dwarf with Red Pear. By hybridization improved dwarf varieties were obtained which may prove to be useful in localities where the disease is a serious danger.

As artificial infestation of the same varieties with infected leafhoppers gave varying results in different seasons it is not regarded as a reliable test of resistance to natural infestation. Resistance, when present, was weak and due, apparently, rather to a tendency to escape infection than to tolerance of the virus. The likelihood of infection taking place was affected by the number of leafhoppers used. When plants were artificially infected not less than 3 weeks after transplanting, the incubation period of the disease varied from 2 to at least 7 weeks. There was no significant difference in the length of this period or in the frequency of

recovery in resistant and susceptible varieties, and resistance was not increased in plants which had recovered or in their progeny.

CHATTERJEE (N. C.). DOVER (C.), HICKS (H. A. H. G.), MITCHELL (J. E. M.), SREENIVASAYA (M.), & IYENGAR (A. V. V.). **Investigations on the spike-disease of Sandal. I. Résumé of observations made to date. II. Report of progress made during the quarter ending 30th June 1931.**—*Indian Inst. of Sci., Bangalore*, 16 pp., 1931.

A general account is given of the history of spike disease of sandal [*Santalum album*], together with a brief sketch of the investigations on this problem conducted at the Indian Institute of Science in co-operation with the Madras Forest Department. The outstanding results of these researches have already been noticed [*R.A.M.*, xi, p. 81].

STAPP (C.). **Derzeitiger Stand der Erforschung des 'Ulmensterbens'.** [Present status of research on die-back of Elms.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), pp. 334–342, 1931.

The writer summarizes and briefly discusses the leading researches of the past few years in Germany and elsewhere on the die-back of elms associated with *Graphium ulmi* [see above, p. 275]. Notes are also given on the legislative measures recently enforced against the disease in various countries.

GROVE (A.). **The Elm disease.**—*Gard. Chron.*, xc, 2343, p. 396, 1931.

According to the annual summary of the Forestry Commission on the progress of the elm disease due to *Graphium ulmi* in England [*R.A.M.*, viii, p. 342], there is no apparent abatement either in the severity of the infection or in its spread through the country. The addition of Huntingdon, Lincoln, and Monmouth to the counties already known to be infected brings the total to 33, but so far no case has been reported from Scotland. Certain areas seem to constitute centres of infection where the number of diseased trees constantly tends to increase. In all districts small, middle-aged trees are the most susceptible, and cases of apparent recovery of diseased trees have been observed in certain areas. The extraordinary virulence the disease may assume is illustrated by the death in September, 1931, of some 40-year-old trees at Redhill which showed no symptoms until the preceding June. An opportunity of testing varietal resistance to the disease [the most recent information on which is briefly summarized] is afforded by a recent outbreak in an arboretum in Norfolk containing many species and varieties of *Ulmus*.

OVERDIJKINK (G. A.). **De Iepenziekte.** [The Elm disease.]—*Nederl. Boschbouw-Tijdschr.*, iv, 12, pp. 383–389, 1931.

An account is given of the present status of the elm disease (*Graphium*) [*ulmi*] in Holland, with special reference to its practical silvicultural aspects [*R.A.M.*, xi, p. 138]. In south Limburg the magnificent elm stands of ten years ago have

practically disappeared, while North Brabant has also suffered heavy losses. Generally speaking, the disease is less prevalent in the coastal districts, though here also it is steadily increasing, especially in south Beveland. Infection almost always starts in more or less dense plantings, where it is evidently favoured by the stagnant air, a factor which also contributes to the spread of the elm sap beetles [*Scolytus scolytus*]. Recent investigations on the part played by these insects in the transmission of the disease are summarized.

In a postscript to this paper (pp. 389–391) F. W. Malsch states that an elm disease exhibition was held at Utrecht from 1st to 6th October, 1931, and visited by persons from all parts of the country.

Spaulding (P.) & MacAloney (H. J.). **A study of organic factors concerned in the decadence of Birch on cut-over lands in northern New England.**—*Journ. of Forestry*, xxix, 8, pp. 1134–1149, 8 figs., 1931.

In connexion with a study of the various factors concerned in the deterioration of paper and yellow birch (*Betula papyrifera* and *B. lutea*) in northern New England, *Armillaria mellea* was found in the root systems of 53 out of 305 trees examined, but always in a secondary capacity following injury from other causes. Once it has gained access to the roots, however, this fungus undoubtedly contributes to their destruction. *Libertella betulina* was constantly found on the dead twigs and branches of decadent birches in slash piles, but here again no evidence of parasitic action was obtained.

The first indication of deterioration consists of a slight thinning of the foliage in the topmost twigs. During the hot weather of midsummer the leaves are abnormally small and roll as if from drought. Short twig tips appear without leaves, and just below them the foliage is also small and rolled. Whole branches and ultimately the entire crown become involved.

Lohwag (H.). **Mykologische Studien. VI. Spongipellis litschaueri (= Polyporus schulzeri Fr. sensu Bresadola).** [Mycological studies. VI. *Spongipellis litschaueri* (= *Polyporus litschaueri* Fr. *sensu* Bresadola).]—*Arch. für Protistenkunde*, lxxv, 3, pp. 297–312, 2 pl. facing p. 522, 2 figs., 1931.

In the course of his taxonomic notes on Polyporaceae, the author states that the examination of *Polyporus obtusus* Berk., the agent of an oak disease in the United States, shows it to possess all the characters of a *Trametes*, as indicated by Bourdot and Galzin, and it should be known as *T. obtusa*.

Lutz (L.). **Sur la luminescence du mycélium de l'Armillariella mellea Vahl. Action des anti-oxygènes.** [On the luminescence of the mycelium of *Armillariella mellea* Vahl. Action of anti-oxidizers.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 1–4, 1931.

The author states that when pieces of wood (oak and poplar) permeated with the mycelium of *Armillariella* [*Armillaria*]

mellea and strongly phosphorescent in the dark were exposed to the action of substances known to inhibit oxidation, such as ether, benzaldehyde, ethyl aldehyde, cresol, and the like, the luminescence was suspended in a time varying from 5 to 60 minutes, and was restored when the pieces of wood were put into test tubes with an excess of oxygen [*R.A.M.*, ix, p. 278]. This fact would indicate, in his opinion, that the luminescence of the mycelium of *A. mellea* is of the nature of auto-oxidation.

BABEL (A.). **Pappelsterben.** [The dying-off of Poplars.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), pp. 415–416, 1931.

A brief note is given on the occurrence in Westphalia of *Dothichiza populea* chiefly on young Robusta poplars [*Populus robusta*] of French origin [*R.A.M.*, xi, p. 138], the Lombardy and Canadian poplars [*P. nigra* var. and *P. canadensis*], however, being also affected [see next abstract]. The cortex becomes covered with black spots, which may finally girdle the trunk; below the diseased areas the tissue is necrotic and dark coloured. In the autumn small, round pustules are formed on the lesions and subsequently rupture, extruding the grey spores of the fungus.

QUAIRIÈRE (C. J.). **A propos d'une maladie des jeunes plantes de Peuplier du Canada.** [On a disease of young Canadian Poplars.]—*Bull. Soc. Centr. Forest. Belgique*, xxxviii, 9, pp. 391–397, 1931.

In the spring of 1929, as a result of infection by *Dothichiza populea* [see preceding abstract], a grower in the province of Liège, Belgium, lost about 800 young Canadian poplars [*Populus canadensis*] out of 1,000 planted the previous winter. The disease was further reported from Namur in the same year, and also from near Lommel, in 1930.

Of 10,000 poplar trees planted in the province of Antwerp over 2,000 were killed by *D. populea*, nearly all of them Raverdeau's poplar (*P. angulata* [var.] *robusta*). The trees were sent out from the nursery between December, 1930, and April, 1931, and the later plantings remained almost unaffected. The original nursery showed no trace of infection, and the facts that the trees had been prematurely uprooted and removed in December and that they had been brought from France with bare roots are considered to have predisposed the trees to the disease.

Directions for the control of the disease (including the removal of trees for planting not earlier than the end of December) [cf. *R.A.M.*, iii, p. 244] are briefly indicated.

WORMALD (H.) & HAMOND (J. B.). **The distribution of bacterial blight of Walnuts.**—*Gard. Chron.*, xc, 2348, pp. 476–477, 3 figs. (2 on pp. 478–479), 1931.

Bacterial blight of walnuts (*Pseudomonas* [*Bacterium*] *juglandis*) [*R.A.M.*, xi, 79] is stated to have been found in North and South America, Australia, New Zealand, South Africa, Switzerland, Italy, and Holland, as well as in England, where it has been observed on young trees at East Malling and on large established

ones in Kent, Surrey, Sussex, and Worcestershire. Recently an organism apparently identical with *Bact. juglandis* was isolated by Dufrénoy from a walnut tree in the Isère Department, France, and inoculation experiments at East Malling proved conclusively that this strain is capable of causing the typical bacterial blight lesions on the shoots, petioles, and fruits.

SMITH (C. O.) & BARRETT (J. T.). **Crown rot of Juglans in California.**—*Journ. Agric. Res.*, xliii, 10, pp. 885–904, 9 figs., 1931.

This is the full paper on the collar and root disease of the black walnuts (*Juglans californica* and *J. hindsii*) used as root-stocks for *J. regia* trees in California, an abstract from which has already been noticed [*R.A.M.*, x, p. 214]. In spite of the difficulty presented by the isolation of the pathogen, presumably owing to the toxicity of the exudate from diseased walnut tissue, evidence is convincing that the disease is caused by a species of *Phytophthora* which is provisionally identified as *P. cactorum*. For purposes of control the use of a resistant stock, the proper regulation of irrigation water, and the removal of soil to expose the crown are recommended.

WOLLENWEBER [H.]. **Fusarium an Walnuss.** [*Fusarium* on Walnut.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xliii (*Jahrbuch*), p. 447, 1931.

The examination of walnut leaves and fruits submitted by a correspondent in Berlin revealed the presence on the former of *Fusarium sambucinum* [*R.A.M.*, vi, p. 624] and on the latter of *F. lateritium* [see above, p. 306]. The occurrence of *Fusarium* on walnut fruits has been reported from France and Italy, but there is believed to be no previous record of this genus on the foliage. *F. lateritium* may well be parasitic on walnuts, since it is already known as the agent of decay in a number of fruits.

DAVIS (W. H.). **Corynose twig blight of the American Bladder Nut, Staphylea trifolia.**—*Phytopath.*, xxi, 12, pp. 1163–1171, 1 fig., 1931.

This is an expanded account of the writer's observations and experiments on the destructive twig blight of the American bladder nut (*Staphylea trifolia*) in Massachusetts caused by *Coryneum microstictum* var. *staphyleae*, the salient features of which have already been noticed [*R.A.M.*, x, p. 419].

GUINIER (P.). **Note sur deux Pucciniastrum nuisibles aux conifères.** [Note on two species of *Pucciniastrum* injurious to conifers.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 373–375, 1931.

The author states that *Pucciniastrum chamaenerii* occurs over the whole of France on firs [*Abies* spp.], wherever these trees grow in association with the alternate host (*Epilobium spicatum*) [*E. angustifolium*] of the fungus. The parasite is not of appreciable economic importance to adult trees, but severe outbreaks on young plantations, such as occurred in 1931 on areas reafforested since

the war, may result in seriously impairing the vigour of the trees. *P. padi* [*Thecopsora areolata*: *R.A.M.*, vii, pp. 33, 34; viii, p. 344] was found in 1927 and in the subsequent years on cones of *Picea excelsa* in several localities of Auvergne, where the trees were introduced some 100 years ago, but where the alternate host (*Prunus padus*) is native. It is believed that this fungus is also present in the French Alps and in the Jura.

KAMEI (S.). **A new species of Milesina parasitic on Polypodium vulgare L.**—*Trans. Sapporo Nat. Hist. Soc.*, xii, 1, pp. 27–34, 3 figs., 1931.

A technical diagnosis is given in English of *Milesina jezoensis* Kamei et Hiratsuka n. sp., collected on *Polypodium vulgare* in the Ishikari and Tokachi provinces, Japan, inoculation experiments with sporidia indicating that the alternate host is *Abies mayriana*.

The rust produces on the *Abies* subcuticular, globose spermogonia, 110 to 165 μ in width by 110 to 130 μ in height, scattered on yellowish discoloured areas; obclavate, septate spermatiophores; and oblong spermatia, 6·5 to 9 by 2 to 3 μ. The subepidermal uredosori, which occur on *P. vulgare*, are light brown to brownish-yellow, bullate, and measure 0·2 to 0·4 mm. across; the uredospores are broadly clavate, obovate to oblong-ovate, often short-stalked, 37 to 48 by 17 to 24 μ, with hyaline wall and contents. The firm, thin-walled peridia consist of isodiametric or irregularly polygonal cells, measuring 10 to 25 by 7·5 to 15 μ, and dehisce by a central pore formed under the stomatal slit. The bi- to multicellular, subglobose to oblong, thin-walled, smooth teleutospores, with radial vertical septa, are formed singly or in compact masses in the epidermal cells and measure 26 to 44·5 by 23 to 30 μ. From each cell a cylindrical to clavate, four-celled basidium is developed through a minute hole in the epidermal wall; it measures about 45 by 10 μ, and bears subglobose sporidia, 11 by 7 μ.

A table is given showing the difference between *M. jezoensis*, *M. dieteliana*, and *M. polypodophila* [*R.A.M.*, ix, p. 420].

RUMBOLD (CAROLINE T.). **Two blue-staining fungi associated with bark-beetle infestation of Pines.**—*Journ. Agric. Res.*, xliii, 10, pp. 847–873, 8 figs., 1931.

This is a detailed morphological and cultural account of the species of *Ceratostomella* which investigations since 1926 have shown to be constantly present in still living pines (*Pinus* spp.) [which are specified] in the United States, attacked by bark beetles and the sapwood of which is stained blue. The first species (*C. pini*) [*R.A.M.*, x, p. 564] grows into the sapwood from the galleries made by *Dendroctonus frontalis* in the eastern States, and by *D. brevicomis* in California and Idaho; it was also found in the sapwood of pines near Washington, D.C., that had been injured mechanically and were infested with mites and insects other than *Dendroctonus*. In pure culture these three strains of *C. pini* showed some differences. The colour of the wood stained by this species is grey, shading from a light neutral to a dark neutral grey, while the medullary rays and resin ducts appear

black. When freshly split open in a moist condition, the stained wood has a steel-blue or purplish cast. The hyphae of the fungus grow first into the parenchyma cells of the wood rays, and spread from them into the adjoining tracheids, generally through the bordered pits.

The second species was found growing from the galleries of *Ips calligraphus* and *I. grandicollis* in pines in the region from Pennsylvania to Florida. It is considered to be new to science and is named *C. ips* [a diagnosis in English being appended]. Its method of growth into the sapwood is very similar to that of the first species. In pure culture the young hyphae are hyaline, 2 to 3 μ wide, later becoming brown and 3·5 to 10·4 μ in diameter. The young conidiophores are hyaline, unbranched, and bear the conidia in clusters; later they are brown at the base, with biverticillate branches at the top, bearing solitary conidia, which collect in heads held together by a mucilaginous substance; the conidia are hyaline, obovoid to ellipsoidal, and measure 3 to 10·5 by 1 to 3 μ. The perithecia are black, globose, slightly hirsute, 96 to 320 by 55 to 301 μ (mean 206 by 198 μ) in diameter, with a neck from 215 to 3,860 μ (mean 1,273 μ) in length, and an ostiole usually without terminal filaments. The asci are ephemeral, polyhedral, 9 to 10·4 by 7 to 8 μ in diameter, and contain 8 hyaline, cylindrical or slightly curved ascospores measuring 3·3 to 4·2 by 1·2 to 2·8 μ (mean 3·8 by 2 μ). The stain caused by this fungus is slate-grey shading to slate-black, the wood rays and resin ducts appearing black; freshly stained and moist sapwood has a steel-blue cast on splitting.

OEHM (G.). **Zur Morphologie und Anatomie der Bergwerkspilze Lentinus squamosus (Schaeffer) Fries und L. squ. f. suffrutescens Brot. (Beiträge zur Kenntnis der Hymenomyceten. I.).** [On the morphology and anatomy of the mine fungi *Lentinus squamosus* (Schaeffer) Fries and *L. squamosus* f. *suffrutescens* Brot. (Contributions to the knowledge of the Hymenomycetes. I.).]—*Arch. für Protistenkunde*, lxxiii, 3, pp. 371–422, 1 pl., 20 figs., 1931.

A comprehensive account is given of the writer's studies, conducted at Prague, Czecho-Slovakia, on *Lentinus squamosus* [*L. lepideus*] [*R.A.M.*, x, p. 572] and *L. squamosus* var. *suffrutescens*, the former occurring commonly on timber above ground, while the latter predominates in mines.

The anatomical structure of both organisms was found to be identical. Above the lamellae and in the subhymenium the hyphae generally develop into cylindrical, binuclear cells, occasionally a good deal thicker than the normal, and interspersed among these are varying numbers of sap hyphae. The basidia arise from transverse hyphae or subhymenial cells.

The thickening of the hyphal walls is accompanied by a reduction of the lumen and frequently also by nodosities. The chemical nature of this process could not be fully elucidated, but the bulk of the walls was found to consist of chitin. The lumen of all the hyphae stains red with safranin.

CARTWRIGHT (K. St. G.), FINDLAY (W. P. K.), CHAPLIN (C. T.), & CAMPBELL (W. G.). **The effect of progressive decay by Trametes serialis Fr. on the mechanical strength of the wood of Sitka Spruce.**—*Dept. of Sci. & Indus. Res., Forest Products Res. Bull.* 11, 18 pp., 4 pl., 1 fig., 6 graphs, 1931.

A full account is given of an investigation undertaken in order to ascertain the effect of attack by *Trametes serialis* on the mechanical strength of wood and the relationship thereto of changes in chemical composition and specific gravity of the wood.

The timber selected was Sitka spruce (*Picea sitchensis*) and test pieces were cut measuring 5 × ⅜ × ⅜ in., carefully prepared from selected, sound wood. They were sterilized by steaming and inoculated with *T. serialis* [*R.A.M.*, ix, p. 617]. Two distinct series of mechanical tests were made, one on pieces subjected to fungal attack and the other on sterilized control pieces. The tests were carried out on a 10,000 lb. Denison Universal testing machine, using the 1/10 scale poise weight.

The results obtained [which are tabulated, expressed graphically, and discussed] showed that after two weeks' exposure to *T. serialis* the timber suffered over 15 per cent. loss in mechanical strength. The loss in strength subsequently was very rapid if favourable conditions for the growth of the fungus were maintained, and the rate of loss continued to be fairly constant until a loss was reached of 80 per cent. of the original strength values of the timber, when the rate became rather slower. The advance of the attack was indicated by a steady increase in brittleness and by the greater brashness seen in the fractures. The wood did not at first change much in its general appearance, but chemical examination showed that an increased proportion was soluble in alkali, this progressive increase in alkali solubility being very closely correlated with the falling away of the mechanical strength, as measured by the equivalent fibre strength at maximum load. There was no significant loss in dry weight until after five weeks in one experiment and after four weeks in another: thence onwards the rate of loss was fairly regular. After 10 weeks 16·4 and 14·6 per cent. dry weight, respectively, had been lost.

Decomposition (hydrolysis), as evinced by increased alkali solubility, preceded loss in weight, indicating that the fungal attack alters the wood considerably before any appreciable quantity of material is actually removed by fungal respiration and transpiration. The loss in strength is therefore apparently due to chemical action on the cell wall substance rather than to a physical breaking down of the walls by hyphal penetration.

No difference in the method of attack in the earlier and later stages could be observed microscopically; the degree of decay could be estimated only very roughly by examination of the amount of mycelium present and the condition of the cell walls.

CAMPBELL (W. G.). **The chemistry of the white rots of wood. II. The effect on wood substance of Armillaria mellea (Vahl.) Fr., Polyporus hispidus (Bull.) Fr., and Stereum hirsutum Fr.**—*Biochem. Journ.*, xxv, 6, pp. 2023–2027, 1931.

Continuing his studies on the chemistry of the white rots of wood

[*R.A.M.*, x, p. 149], the writer examined the effects of *Armillaria mellea* on beech wood, *Polyporus hispidus* on ash heartwood, and *Stereum hirsutum* on oak sapwood. The technique of the experiments, which was similar to those previously reported, is briefly described and the results tabulated and discussed.

The three types of white rot were found to possess only one feature in common, which is shared by that due to *Polystictus versicolor*, namely, the absence of any marked increase in the total alkali solubility of the major components of wood substance. In wood rotted by *P. versicolor* and *A. mellea* this has been proved to be attributable to the diminishing solubility in 1 per cent. NaOH as decay proceeds of the pentosans outside the cellulose. The white rots in question are thus sharply differentiated from the brown rots, in some of which the residual wood substance, even in the advanced stages of decay, is much more soluble in alkali than the original sound material.

The essential similarity of the detailed chemical action on the wood substance of *Polyporus hispidus* and *S. hirsutum* has been established, but whereas these organisms attack the pentosans in the cellulose and cause little damage to those outside it, *Polystictus versicolor* produces an exactly opposite effect. The decay caused by *A. mellea*, though possessing the chemical characteristics of both brown and white rots, may reasonably be considered to belong predominantly to the latter type in view of its action on the alkali-solubility of the rotted residue.

S. hirsutum does not appear to exercise a selective action on lignin. The white patches or 'pockets' in wood attacked by this fungus merely represent areas in which decomposition has progressed to a greater extent than in the surrounding material. In these regions cellulose is decomposed as well as lignin, some of which still remains even after the development of the white appearance.

MOLL (F.). **Eine bemerkenswerte Zerstörung hölzerner Eisenbahnschwellen.** [A remarkable destruction of wooden railway sleepers.]—*Forstwissensch. Centralbl.*, liii, 21, p. 771, 1932.

A brief note is given on the destruction of beech wood railway sleepers on a south German line by a species of *Polystictus*, which produced a typical white rot, disorganizing the lignin and leaving the cellulose intact [cf. preceding abstract]. The sleepers were stated to have been impregnated with coal-tar oil, no trace of which, however, was to be found in the wood, and it is concluded that the treatment was very inadequately performed.

Dry-rot in timber.—*Dept. Sci. & Indus. Res., Rept. Building Res. Board for the year 1930*, p. 111, 1931.

A serious outbreak of dry rot [*Merulius lacrymans*] is reported in a large housing estate, situated on damp clay soil where drainage had been attended by considerable difficulty. The condition was attributed to the inadequacy of the sub-floor ventilation, the air bricks being too near the ground and having only about 3 sq. in. of unobstructed opening per brick. The timber plates

given a brush-applied coating of preservative had in some cases been destroyed by the fungus.

LABROUSSE (F.). **Observations sur quelques maladies des plantes maraîchères.** [Observations on some diseases of market-garden plants.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 8–9, pp. 286–289, 1931.

The wilt of spinach caused by *Pythium ultimum* [*R.A.M.*, x, p. 768 et seq.] was not found to attack plants sown after 15th September. Affected plants which were not killed off in the autumn were able to seed the following spring. Such plants (which showed the presence of *P. ultimum* in all their aerial organs) had a peculiar stunted and witches' broom like appearance. Both so-called 'summer' and 'winter' varieties of spinach are susceptible; tests with 48 varieties failed to show any appreciable resistance.

Eleven out of 167 types of chick pea (*Cicer arietinum*) showed definite resistance to anthracnose (*Ascochyta rabiei*) [ibid., xi, p. 150]; none of the Indian types tested was resistant. When two susceptible types and one resistant type were sown at intervals of 10 days from 1st April until 20th June, each retardation of the date of sowing increased the period between the emergence above the ground and the complete destruction of the susceptible plants (38 days for plants sown on 1st April, 67 days for those sown on 20th June).

A bacterial disease of beans [*Phaseolus vulgaris*] was reported from Croissy (Seine-et-Oise) on the Gloire de Vitry variety and from the vicinity of the Loire on Surpasse Empereur. On the leaves the lesions somewhat resembled those produced by *Colletotrichum lindemuthianum*, but the necrotic areas were ringed by a distinct yellowish-green halo and had an oily aspect very noticeable on young spots and on the under surface of the leaves. On the pods oily spots appeared, usually near the suture; during wet weather they rapidly spread and reduced the whole pod to a viscous mass. The disease was artificially reproduced by inoculation with an organism obtained from diseased material and provisionally identified with *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, ix, p. 437; x, pp. 423, 434, 436]. Of 30 bean varieties inoculated, one, 'Nain abondant', remained unaffected; growers in the vicinity of Nozay (Seine-et-Oise) reported that this variety had remained healthy when Prodige de Courtry beans growing in identical conditions were severely infected.

PRASAD (H. H.). **A bacterial white soft rot of Turnip.**—*Indian Journ. Agric. Sci.*, i, 5, pp. 534–537, 1931.

In February, 1931, a number of well-grown turnips at Pusa were affected by a soft, white, malodorous root rot due to an organism closely resembling *Bacillus aroideae* or *B. melonis* [*R.A.M.*, x, pp. 125, 575], a technical description of which is given in English. Inoculation experiments through wounds on healthy, growing turnips resulted in the typical symptoms after about two days. The organism proved capable of rotting raw sterile turnips (from which it was re-isolated), sterile pieces of potato, sweet

potato, artichoke, beet, brinjal [*Solanum melongena*], radish, onion, carrot, cucumber, and musk melon. Corms of an ornamental plant belonging to the Amaryllidaceae were readily attacked, while cauliflower heads and stalks and cabbage stalks also proved susceptible.

WHITEHEAD (T.). **Dry-rot of Swedes. Second progress report.**—*Welsh Journ. of Agric.*, vi, pp. 289–295, 1930. [Received October, 1931.]

The investigation of the cause of the serious outbreaks of dry rot of swedes (*Phoma lingam*) which occur in North Wales [*R.A.M.*, viii, p. 691; x, p. 766] was continued by the author in 1929. All attempts to isolate the fungus from commercial samples of seeds were fruitless, and field tests with suspected seed also gave negative results.

In order to test the importance of rotting roots as a source of infection, seed was sown under oats in a field which had carried a badly infected crop of swedes the year before; six groups of infected seedlings were later located, an old root with dehiscing pycnidia being found with each diseased group. One isolated infected seedling was also found with no apparent source of infection in the vicinity. Subsequently, after the oats were cut, not only was there no evidence that the disease had spread, but it was no longer possible even to locate the originally infected seedlings.

The results of comparative experiments with swedes dressed with farm-yard manure and artificial fertilizers, respectively, indicated that contamination from the farm-yard manure was negligible.

In conclusion the author reviews the evidence regarding the seed transmission of *P. lingam* [ibid., ix, p. 218; cf. also viii, p. 752; ix, p. 151; x, pp. 327, 584, 766; xi, p. 95], quoting a verbal report by Buddin who found infection of one diseased seed per four or five thousand, and brings forward reasons for attaching importance to the exceedingly minute seed infection as a source of outbreaks.

SEAL (J. L.). **Diseases of winter Peas and Vetches caused by Mycosphaerella and Ascochyta.** [*ex* Botany and Plant Pathology.]—*Forty-second Ann. Rept. Alabama Agric. Exper. Stat. for the fiscal year ending June 30, 1931*, pp. 46–47 [? 1931].

The diseases of winter peas and of vetches [*Vicia* spp.] caused by *Mycosphaerella* [*pinodes*] and *Ascochyta* [*pinodella*: *R.A.M.*, xi, p. 150] were generally prevalent during the period under review. Although Oregon-grown seed showed barely a trace of disease compared with 8 per cent. on local-grown, the plants developing from both lots in adjoining areas were about equally infected in the late spring. A small amount of initial infection, therefore, may cause a high incidence of disease during the growing season. Forty different seed treatments were applied to local-grown peas without effect, but steam sterilization of field soil proved beneficial.

Cook (M. T.). **Powdery mildew disease of snap Beans.**—*Virginia Truck Exper. Stat. Bull.* 74, pp. 931–940, 2 figs., 1 graph, 1931.

Powdery mildew of snap beans [*Phaseolus vulgaris*] was first noticed by the author in Virginia early in September, 1930, and by the middle of October, the plants were so severely injured that it was evident that the yield would be reduced. The stems, petioles, and leaves were heavily coated with mildew, and many of the leaves had turned yellow and died. In addition, most of the pods picked from then on were so badly spotted and deformed as to be unmarketable. On the pods the spots are circular and may be mere specks or attain 5 mm. in diameter. Two or more spots frequently coalesce into large irregular lesions which may affect the entire pod. At first, only the white fungal growth is noticeable, but the spots soon turn yellowish- and then reddish-brown. The margins are indefinite and fringed. The fungus may entirely disappear from the older spots, which are often slightly sunken.

As perithecia were not found it was not possible definitely to identify the mildew with *Erysiphe polygoni* [*R.A.M.*, xi, p. 19].

In the autumn of 1930 the disease was most severe when the plants were making very poor growth owing to low temperature and insufficient soil moisture, conditions which a greenhouse test demonstrated to favour the disease. When the test plants were watered and the temperature was raised, they rapidly outgrew their former condition.

A survey of the fields in the autumn of 1930 indicated that whereas the Bountiful and Hodson Wax varieties are very susceptible, Refugee beans are quite resistant. Four control applications of a sulphur spray or dust are suggested, whilst it is also recommended that in sorting and grading the crop for market special care should be taken to remove any diseased pods.

Sardiña (J. R.). **Dos nuevas enfermedades de las Habas.** [Two new diseases of Broad Beans.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 59–80, 17 figs., 1931.

The morphological characters of *Botrytis fabae*, the causal organism of a decay of broad beans (*Vicia faba*) in Madrid, Seville, Cadiz, and other parts of Spain, have already been described [*R.A.M.*, ix, p. 424].

Under favourable conditions, the fungus may cause losses amounting to 80 or 100 per cent. of the crop. The first symptom of infection is the development on the leaves and stems of small iron-coloured to dark chestnut spots, surrounded by an orange to garnet-coloured halo. These lesions reach a diameter of 0·5 to 1 cm., at which stage the centre is tobacco-coloured and the surrounding portion consists of alternate pale and dark concentric furrows, with a livid halo. Finally, the lesions converge and the entire aerial part of the plant is killed. New shoots may be produced, but these in their turn are attacked and destroyed.

B. fabae was cultured on a number of standard media, full particulars of its growth on which are given. The optimum temperature for mycelial growth was found to be 30° C., and the

optimum hydrogen-ion concentrations for mycelial, conidial, and sclerotial development P_H 5·3, 7·3, and 4·5, respectively, in one strain of the fungus, and P_H 7·3, 7·7, and 3·9 in another. The results of inoculation experiments on broad beans indicated that a relative humidity of at least 84 or 85 per cent. is necessary to induce infection. None of the varieties of *V. faba* commonly cultivated proved immune from *B. fabae*, but a high degree of resistance was shown by the var. *minor* and 'green' beans, while the Granada and 'acid white' varieties were very susceptible. In inoculation tests the fungus was also pathogenic to French beans [*Phaseolus vulgaris*], peas, blue vetch [*V. cracca*], and lentils.

B. cinerea produces small, dull, dark chestnut to black spots on the leaves of *V. faba*, infection ultimately spreading to the lateral shoots and stems and causing the death of the plants. In the final stages the leaves are shrivelled and blackened or dark grey; hence the name 'grey rot' is proposed for this disease. The cultural characters of the fungus (which did not produce sclerotia) are described, the optimum temperature for mycelial growth being 29°. Inoculation experiments revealed a wide range of pathogenicity for the fungus, which proved capable of attacking the members of several other families.

Both *B. fabae* and *B. cinerea* may be controlled by cultural measures, including the destruction of infected material, supplemented by preventive applications of a standard fungicide, e.g., Bordeaux mixture.

Benlloch (M.) & Del Cañizo (J.). **La 'rabia' de los Garbanzales.** [The anthracnose of Chickpeas.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 128–133, 7 figs., 1931.

A popular account is given of the symptoms and etiology of anthracnose of chickpeas (*Phyllosticta* [*Ascochyta*] *rabiei*) [see above, p. 344] in Spain, with recommendations for its control.

Stolze (K. V.). **Beitrag zur Biologie, Epidemiologie und Bekämpfung der Blattfleckenkrankheit der Zuckerrübe (Cercospora beticola Sacc.).** [Contribution to the biology, epidemiology, and control of the leaf spot disease of Sugar Beet (*Cercospora beticola* Sacc.).]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.* xix, 4, pp. 337–402, 8 figs., 16 graphs, 1931.

A comprehensive account is given of the writer's studies on various aspects of the leaf spot disease of sugar beets (*Cercospora beticola*) [*R.A.M.*, xi, p. 147] in Saxony.

No indication was obtained of specific or varietal immunity from leaf spot within the genus *Beta*. The minimum, optimum, and maximum temperatures for the growth of the fungus were found to be 5°, 25° to 30°, and 40° C., respectively. The mycelium is resistant to prolonged and severe frost, and between 60 and 100 per cent. the influence of the relative atmospheric humidity on its growth is approximately equal. Only a portion of the conidia withstood damp heat (40°), in which the viability of the sclerotial bodies is maintained up to 45° to 50°. Neither the conidia nor the

sclerotial bodies suffered any diminution of viability from exposure to dry heat at 50°.

Comparative experiments with diseased and healthy seed-clusters proved the transmissibility of infection through the seed. The artificial spread of the disease is readily effected both in the field and under glass by strewing dried, ground infected leaves over the plants. The incubation period ranges from 6 days at 21° to 50 at 15° and below, and prolonged incubation is considered to afford an explanation of the absence of symptoms on the young leaves. A wound periderm is formed round the necrotic tissues, and the anthocyanin ring (not a constant feature) may either develop simultaneously or a few days later.

Conidial formation is dependent on a high degree of atmospheric humidity as well as on relatively high temperatures, and the continuance of these conditions for one or two months is an essential for the development of an epidemic. The prediction of violent outbreaks of leaf spot would only be possible after a protracted study of the associated phenological data, and at the present juncture the disease does not constitute a constant menace to beet cultivation in Germany.

Some indications are given for the control of the disease by cultural measures. Breeding for immunity appears to offer little hope of success. The spread of infection may certainly be prevented by the treatment of the seed-clusters with a standard fungicide (betanal, germisan, uspulun, or sulphuric acid), but this expensive process is only justifiable where other purposes are also to be served. Experiments conducted from 1928 to 1930 showed that equally good results are given by spraying with 2 per cent. Bordeaux mixture [cf. ibid., x, p. 427], 1·5 per cent. nosperit, 1·5 per cent. nosprasit [ibid., x, p. 672], or 1·5 per cent. thionosperit, or by dusting with cusisa 1926 [ibid., x, pp. 703, 706], thionosperit, cupulvit [ibid., x, p. 582], and Nos. 1389, 1390, 1391, 1392, and 1393 (Meyer, Mainz). The best time for the application of the treatments was found to be from about 20th July to 20th August, the results being more satisfactory when they were carried out just before and during rainy periods than after heavy showers. In general, three applications at intervals of up to 20 days sufficed to hold the disease in check, but under German conditions the adoption of these methods is not considered to be profitable.

A four-page bibliography is appended.

BENLLOCH (M.). **Experiencias sobre la desinfección de semillas de Remolacha.** [Experiments on the disinfection of Beet seed.]—*Bol. Pat. Veg. y Ent. Agric.*, v, 19–22, pp. 81–85, 1931.

The results [which are discussed and tabulated] of experiments in the control of leaf spot of sugar beets (*Cercospora beticola*) in three localities in Spain [*R.A.M.*, x. p. 427 and preceding abstract] indicated that no decisive increase of production or influence on the amount of infection in the crop was exerted by seed treatment with copper carbonate, uspulun, betanal, and abavit B, although these substances, especially the first-named, definitely augmented germinative capacity. On the other hand, spraying with Bordeaux

mixture (2 per cent.) or Burgundy mixture (1·18 per cent.) with the addition of calcium caseinate throughout the growing season resulted in considerably increased yields (20,400 and 19,200 kg. per hect., respectively, compared with a maximum of 15,549 kg. per hect. in the unsprayed plots sown with disinfected seed).

WEBER (G. F.). **Blight of Carrots caused by Sclerotium rolfsii, with geographic distribution and host range of the fungus.** —*Phytopath.*, xxi, 12, pp. 1129–1140, 6 figs., 1931.

Carrots near Gainesville, Florida, were attacked in 1928 by *Sclerotium rolfsii*, which has apparently not hitherto been recorded on this host. The first symptom of infection is a general yellowing and flaccidity of the older leaves, which finally wilt completely and become prostrate, while the younger foliage also becomes rapidly involved. The roots lose their green or yellow colour and become brown and crisp, while the petioles are readily detached from the crown and may be scattered by the wind, leaving no trace of the plant above soil level. The fungus causes a wet rot of the roots. In advanced stages the central cylinder of the swollen root readily slipped out when the leaves were pulled, leaving the outer cylinder of cortex and phloem in the soil, where it was held by the mycelium. Finally, the decayed carrots dry out and shrink, leaving a cavity in the soil, the walls of such 'sand-wells' being securely held by the dried mycelium of the fungus. Sclerotia develop in profusion on the decaying carrot tissues in these cavities, being observed six inches below the soil.

The fungus was readily obtained in pure culture, and cross-inoculation experiments [the results of which are tabulated] were carried out with the carrot strain and those isolated from twelve other hosts, viz., bean [*Phaseolus vulgaris*], beet, cotton, cucumber, eggplant, lettuce, pea, pepper [*Capsicum annuum*], potato, squash [*Cucurbita* sp.], tomato, and watermelon, with positive results in all cases excluding the eggplant, lettuce, pea, and potato strains on pepper. A list of 189 host plants of *S. rolfsii* is given, including 68 newly recorded from Florida.

PORTER (R. H.). **The reaction of Cucumbers to types of mosaic.** —*Iowa State Coll. Journ. of Sci.*, vi, 1, pp. 95–120, 4 pl., 1931.

Some of the information contained in this paper has already been noticed from another source [*R.A.M.*, ix, p. 427], but the following points are of interest. Cucumber virus 2 (formerly known as 'Bettendorf mosaic') was found to be highly pathogenic to seven varieties of watermelon, African and Green Seed citrons (*Citrullus vulgaris*), West India gherkin (*Cucumis anguria*), and Chinese Long cucumber. Stunting and mottling were common greenhouse symptoms which, however, were frequently outgrown by field plants. The incubation period of cucumber virus 2 is two to four days longer than that of 'white pickle' mosaic (cucumber virus 1) in White Spine plants. Stunting was less pronounced on this variety with the virus 2 type of mosaic than with white pickle, and in no case did it produce any symptoms on the fruits. Segregation for resistance and susceptibility to mosaic apparently occurred

in the F_2, F_3, and F_4 generations of crosses between Chinese Long and White Spine, and in the first generation from the back crosses. When the back cross of F_1 × Chinese Long was used, the segregates were more commonly resistant and tolerant plants.

HAENSELER (C. M.). **Control of seed decay and damping-off of Cucumbers.**—*Fifty-first Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1930,* pp. 254–264, 1930. [Received March, 1932.]

Heavy losses (up to 90 per cent. of the stand) are stated to occur annually in the cucumber fields and greenhouses of Atlantic County and elsewhere in New Jersey as a result of seed decay and damping-off due to *Pythium de Baryanum* [*R.A.M.*, x, p. 12] and *Rhizoctonia* spp.

The results [which are fully discussed and tabulated] of preliminary experiments in the control of these conditions in the Early Fortune variety showed that a number of copper carbonate and organic mercury dusts (e.g., semesan jr.) are effective for this purpose, especially when applied to seed previously moistened with a 4 per cent. glue solution (1 part of dust to 20 parts of seed). Seed treatment alone, however, is inadequate against severe attacks of damping-off, and should be supplemented by the application to the soil of 1 in 100 or 1 in 200 formalin at the rate of 100 to 200 c.c. per hill immediately after planting. The best protection was given where the formalin was combined with Bordeaux mixture at planting time, while very good results were also given by the application of Bordeaux mixture and copper-lime dust at germination, preceded by seed treatment.

KAWAMURA (E.). **New fungi on Sesamum indicum L.**—*Fungi (Nippon Fungological Soc.)*, i, 2, pp. 26–29, 4 figs., 1931.

Macrosporium sesami Kawamura, n. sp., found on sesame (*Sesamum indicum*) leaves in Fukuoka, Japan, is characterized by simple, erect, more or less flexuose, yellowish-brown, 1- to 5-celled conidiophores, arising singly or in fascicles, measuring 51 to 90 by 4 to 6 μ and each bearing a single conidium at the apex. The fusiform or obclavate, yellowish-brown to dark olivaceous conidia, 30 to 111 by 9 to 33 μ, have 3 to 13 transverse and a few longitudinal septa, at which they are slightly constricted, and terminate in a long, hyaline beak, 20 to 210 by 2 to 3 μ.

The 1- to 7-celled conidiophores of *Alternaria sesamicola* Kamamura, n. sp., on the same host [cf. *R.A.M.*, vii, p. 764], are similar to the foregoing and measure 30 to 90 by 3 to 5 μ. The obclavate, yellowish-brown conidia, produced singly or in chains at the tips of the conidiophores, measure 26 to 80 by 7 to 14 μ and have 2 to 10 transverse and a few longitudinal septa.

VERGE [G.] & RAVAZ [L.]. **La concentration de la sève et la résistance aux maladies.** [Sap concentration and disease resistance.]—*Rev. Gén. du Froid et Indus. Frig.*, xii, 2, p. 45, 1931.

In order to determine the possible relationship between sap con-

centration and reaction to fungous diseases in vine [*R.A.M.*, xi, p. 156], the writers determined the freezing points of the following varieties, viz., Rupestris du Lot −0·665° [C.], Riparia −0·74°, Cordifolia −0·74°, Lincecumii −8·72°, Aramon −0·735°, Grenache −0·78°, 7120 −8·685°, and 5813 −0·76°. These results are conflicting, the sap concentration of the susceptible vines not being consistently lower than that of the resistant ones. On the same vine stock, however, the concentration decreases regularly from the mature to the young leaves, viz., four basal leaves, −0·96°, four following −1·12°, next four −0·963°, next four −0·866°, and growing tip −0·765°. The mature leaves are immune from black rot [*Guignardia bidwellii*] and anthracnose [*Gloeosporium ampelophagum*], and comparatively resistant to mildew [*Plasmopara viticola*], so that there is an evident connexion between sap concentration and resistance in the same variety.

CHABROLIN (C.). **Le mildiou de la Vigne dans ses rapports avec la pluviométrie en Tunisie. Procédés de lutte.** [Vine mildew in its relations to rainfall in Tunis. Control precedure.]— Reprinted from *Bull. Direct. Gén. de l'Agric., Comm., et Colonis.* [Tunis], 22 pp., 1931.

The cultivation of the vine in Tunis extends over an area of some 40,000 hect., situated almost entirely at the base of Cap-Bon, between the town of Tunis in the north and Grombalia in the south, and receiving an annual rainfall of 400 to 500 mm. Mildew [*Plasmopara viticola*: *R.A.M.*, xi, p. 153] is present every year, but its practical importance is usually negligible, except occasionally, as in 1915 and 1921, when it caused heavy losses. An examination of the [tabulated] figures shows that in both these years there was copious rain during March to June with heavy showers at the end of March, which caused the oospores of *P. viticola* to germinate shortly after the buds emerged. The incubation period being approximately one week, it is calculated that in 1915 there were 11 successive waves of infection, while in 1921 not fewer than 9 occurred. The years in which infection was negligible were usually those in which rain was infrequent during spring and early summer. Other factors affecting any onset of the disease are prevailing temperature and, more especially, the sirocco, the latter suppressing an incipient attack of *P. viticola* more effectively than any control measure adopted.

While the first wave of infection appears to be of no practical importance, the second may destroy the young fruit clusters, and its onset should be prevented by making an application of copper sulphate mixture as soon as the young shoots are 10 to 15 cm. long. If heavy rain falls at this period, and especially if traces of mildew are noted, a second application should be made about a week after the first, before the fruit clusters are quite covered by the leaves. One or two early applications having been made, further treatment may be delayed until the disease definitely appears; under Tunisian conditions, one or two copper sulphate applications should be sufficient in two years out of three.